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ABSTRACT

Results of the seventh year of testing by the Pupil Assessment Program of the Wisconsin Department of Public Instruction are presented. In 1982, objective-referenced tests in science, mathematics, and geometry were given to a sample of Wisconsin's public school students in grades 4, 8, 11, and 12. Students were also given the Comprehensive Tests of Basic Skills (CTBS) in mathematics, reading, and language arts. An overview of results includes the following: (1) in science, grade 11 students scored higher than grade 8 students on all test objectives; (2) in computation/applications, students maintained their achievement level; (3) in geometry and number sentences, a comparison of 1982 and 1979 scores shows no significant change in achievement level; and (4) scores of grade 4, 8, and 11 students exceeded the national average on the CTBS. (PN)

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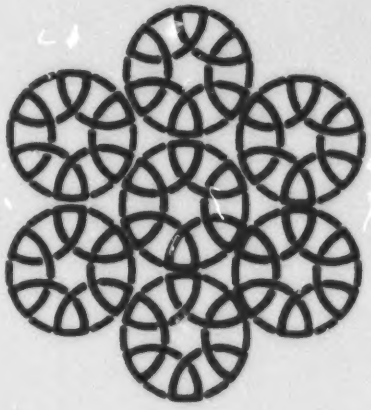
1982 WISCONSIN PUPIL ASSESSMENT PROGRAM REPORT



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DIVISION FOR INSTRUCTIONAL SERVICES

John T. Benson, Assistant Superintendent

Bureau for Assessment and Testing

Tom Stefonek, Director

Wisconsin Pupil Assessment Program

Russ Allen

Maggie Burke

Rajah Farah

Vicki Fredrick

Susan Ketchum

Angie Wisinger

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1982 WISCONSIN PUPIL ASSESSMENT PROGRAM REPORT

December, 1982

The Wisconsin Department of Public Instruction acknowledges and thanks all those individuals who generously gave of their time and talents to serve on the test development committees.

Bulletin No. 3212

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INTRODUCTION

This report presents the results of the seventh year of testing by the Pupil Assessment Program of the Wisconsin Department of Public Instruction. In March, 1982, several tests in a variety of subject areas were given to statewide samples of Wisconsin's public school students.

Purposes of Statewide Assessment

The results of testing by the Wisconsin Pupil Assessment Program, which was established by legislative mandate in 1971, provide:

- a measure of student performance in selected academic areas;
- a comparison of student performance to a national average in mathematics, reading, and language;
- a description of changes in student scores over a period of years.

Results of the statewide assessment provide a basic profile of how well Wisconsin public school students perform a number of important skills. However, it is important to recognize that scores from any single test cannot be used to judge the total educational program.

Sampling Students

Use of a systematic statewide assessment procedure is necessary to obtain valid and reliable information about educational achievement in Wisconsin public schools. Rather than testing all Wisconsin public school students, representative samples are drawn at selected grade levels. In 1982, students were tested at grades 4, 8, 11, and 12.

The selection of the statewide sample of students is a two-step process. First, representative public schools are chosen according to their geographic location, district size, and grade enrollment. Then, a randomly selected sample of students within each of these schools is tested. Test scores are returned to the school districts.

Each of the test scores shown in this report has been obtained by sampling students at various grade levels. Therefore, each of the scores is an estimate. In practical terms, this means that if all students in the state had been tested, the reported scores might have been slightly different.

As an example, if all students had been given the Comprehensive Tests of Basic Skills the percentile scores obtained might vary by plus or minus two or three percentile points. Likewise, scores on the objective-referenced tests might vary by as many as one or two percentage points.

Tests Administered in 1982

Wisconsin-developed, objective-referenced tests in science, mathematics, and geometry were administered to measure student performance of specific skills. Commercially-developed, norm-referenced tests in mathematics, reading, and language also were administered to compare student performance to a national average. Information about student performance on these tests is presented in this report.

Objective-Referenced Tests

Objective-referenced tests used by the Pupil Assessment Program undergo a systematic and rigorous developmental process. Committees consisting of teachers, parents, employers, and others assume a central role in identifying the objectives or skills to be measured at various grade levels. Most test questions and exercises measuring selected objectives have been written by Wisconsin educators. The number of students taking each of the objective-referenced tests in the 1982 assessment is shown in the following table:

Grade Level	Test Form	Number of Students Sampled
4	Computation/Applications	1,746
4	Geometry/Number Sentences	1,669
8	Computation/Applications	1,684
8	Geometry	1,674
8	The Nature of Science	1,723
8	Science and Society	1,633
11	The Nature of Science	1,713
11	Science and Society	1,685
12	Computation/Applications	1,619
12	Geometry	1,591
	Total	16,737

Norm-Referenced Test

A norm-referenced test, the Comprehensive Tests of Basic Skills (CTBS), was given to over 10,000 students in 1982 to determine how Wisconsin students compare nationally in mathematics, reading, and language. These tests, produced by CTB/McGraw-Hill, are specifically designed to compare individuals or groups with a national average. The number of students taking the CTBS is shown in the following table:

Grade Level	Test Form	Number of Students Sampled
4	CTBS - Mathematics	1,746
4	CTBS - Reading and Language	1,700
8	CTBS - Mathematics	1,836
8	CTBS - Reading and Language	1,732
11	CTBS - Mathematics	1,631
11	CTBS - Reading and Language	1,623
	Total	10,268

Assistance Provided to Schools

In addition to annually administering the statewide testing program previously described, the Wisconsin Pupil Assessment Program provides materials and technical assistance to Wisconsin public and private schools which choose to utilize the statewide objective-referenced assessment tests. In 1982, about 16,000 students from 54 school districts and private schools were tested under this Local Option service.

Listed below are tests available for use under the Local Option. For each test, the number of objectives, number of items, and estimated completion time is shown.

Grade Level	Test Form	Objectives	Items	Estimated Completion Time* (in minutes)
4	Computation/Applications	18	78	50-60
4	Geometry and Number Sentences	13	53	45-50
4	Educational Reading	4	35	45-50
4	Everyday Reading	9	36	45-50
5	Writing: Narrative Essay	1	1	30-45
5	Writing: Expository Essay	1	1	30-45
8	Computation/Applications	23	99	50-60
8	Geometry	16	60	45-50
8	Educational Reading	9	36	45-50
8	Everyday Reading	11	44	45-50
8	Writing: Narrative Essay	1	1	30-45
8	Writing: Expository Essay	1	1	30-45
8	The Nature of Science	5	40	45-50
8	Science and Society	6	36	45-50
11	Writing: Narrative Essay	1	1	30-45
11	Writing: Persuasive Essay	1	1	45-50
11	Writing: Job Application Letter	1	1	30-45
11	The Nature of Science	5	40	45-50
11	Science and Society	6	36	45-50
12	Computation/Applications	23	99	50-60
12	Geometry	16	60	45-50
12	Educational Reading	15	60	45-50
12	Everyday Reading	9	36	45-50
12	Consumer Economics	9	36	20-30
12	Traditional Economics	12	48	45-50
12	U.S. Government	7	71	50-60

*Although students should be given as much time as needed to complete a test, nearly all students will finish within one class period (45-60 minutes)

For more information about the Local Option, contact the Wisconsin Pupil Assessment Program office at (608)266-3126.

OVERVIEW OF 1982 ASSESSMENT RESULTS

Science

1. On identical science tests, eleventh grade students scored higher than eighth grade students on all test objectives. Eleventh graders averaged 70% correct; eighth graders averaged 59%.

2. On the objectives dealing with the Nature of Science, girls scored three percentage points higher than boys at both grade levels.

   On the objectives dealing with the interaction of Science and Society, girls scored the same as boys at the eleventh grade. At the eighth grade, girls averaged one percentage point lower than boys.

3. Student performance was not uniform on all eleven test objectives.

   Both eighth and eleventh grade students scored highest on the objective "Scientists solve problems using a variety of methods to expand knowledge." Of the eleven objectives on the science test, this objective was rated by a statewide sample of science teachers as the most important and also the most emphasized in their classroom teaching.

   Students at both grade levels scored lowest on the objective "Scientists operate within a code of ethics." Of the eleven objectives on the science test, this objective was rated by teachers as the least important and also the least emphasized in their classroom teaching.

4. Approximately one-fifth of eighth and eleventh grade students considered science to be one of their <u>favorite</u> subjects. These students scored higher on both parts of the science test than students who responded otherwise.

5. While approximately 24 percent of eighth graders rated science as one of their <u>least</u> favorite subjects, nearly one-third (32%) of eleventh graders chose this response. These students scored lower on both parts of the science test than students who rated science as one of their favorite subjects or liked it about the same as their other subjects.

6. About one-fifth of eighth and eleventh grade students indicated spending more than 30 minutes each week discussing how science relates to societal issues. At the eleventh grade level, a positive relationship was found between time spent and performance on the Science and Society part of the test. Among eighth graders, the relationship was negative; reasons for this relationship are not known.

7. About 40 percent of eleventh grade students and 36 percent of eighth grade students indicated spending more than 30 minutes each week using the skills and methods of science.

There was a direct positive relationship between the amount of time students indicated they spent doing experiments and solving problems and students' test scores on both parts of the science test. In other words, the more time the students spent using the skills and methods of science, the higher their scores tended to be.

8. About 15 percent of eighth and eleventh grade students indicated spending more than 30 minutes per week discussing what scientists believe and how scientists do their work. At the eighth grade level, this made little difference in test performance. However, at the eleventh grade level, a positive relationship between time spent and test performance was noted.

9. At both eighth and eleventh grade levels, there was a positive relationship between the number of science courses students have taken or plan to take and performance on the science test.

10. Of the students who intend to continue education beyond high school, 16 percent of the eighth graders and 19 percent of the eleventh graders indicated that they were likely to major in science or a science-related area.

    At the eighth grade level, 39 percent of the students reported that they were <u>not</u> likely to major in science or a science-related area. However, 53 percent of eleventh grade students indicated preference for a non-science course of study.

    Students at both grade levels who indicated that they were likely to major in science or a science-related area scored higher on both parts of the science test than those students who indicated otherwise.

11. Over one-half (60%) of the eighth grade students indicated that they plan to take only those science courses which are required by the high school. These students averaged approximately ten percentage points lower on both parts of the science test than those students who plan to take more than the required number of science courses.

12. Analysis of responses of boys and girls to the student questionnaire revealed that 22 percent of the boys and 35 percent of the girls rated science as one of their <u>least</u> favorite subjects. Furthermore, it was shown that of all the students who plan to continue their education beyond high school, 19 percent of the boys and 18 percent of the girls indicated that they are likely to major in science or a science-related area.

    At the eighth grade level, 57 percent of the boys and 65 percent of the girls stated that they plan to take only the required science courses in high school.

Computation/Applications

1. The 1982 Wisconsin Pupil Assessment showed that students have maintained their achievement level on Mathematics: Computation/Applications test questions when compared with previous assessments.

2. The fourth grade students correctly answered 84% of the questions requiring them to add, subtract, multiply, and divide whole numbers. They correctly answered 72% of the items applying computation skills to story problems.

3. The mathematics test designed for both eighth and twelfth grade also tests computation skills including whole numbers, decimals, and fractions, and their application to real life situations. On all items, the twelfth graders scored higher than eighth graders.

4. Eighth grade computation scores ranged from 87 percent correct on using operations with whole numbers to 67 percent correct on using proportion and percent, and 67 percent correct on dividing a fraction by a whole number. When asked to apply those skills to story problems, the scores were lower: 76% correct on money applications, and 62 percent on measurement applications.

5. Twelfth grade computation scores ranged from 89% on addition and subtraction of whole numbers to 72% on dividing a fraction by a whole number. Senior scores on applying computation skills to real life situations averaged 86% on money applications and 76% on measurement applications.

Geometry and Number Sentences

1. Fourth, eighth, and twelfth grade students were tested on a number of geometry skills. Fourth graders were also tested on number sentence learning objectives. The comparison of 1982 and 1979 scores shows no significant change in achievement level.

2. The percentage of items that the students answered correctly on the 1982 assessment are as follows:

    Fourth Grade Geometry: 85% correct
    Fourth Grade Number Sentences: 78% correct
    Eighth Grade Geometry: 67% correct
    Twelfth Grade Geometry: 80% correct

NOTE: Eighth and twelfth graders are given the same geometry test.

The Comprehensive Tests of Basic Skills

1. For the seventh consecutive year, scores of fourth, eighth, and eleventh grade students on the Comprehensive Tests of Basic Skills (CTBS) exceeded the national average. The national average is the 50th percentile.

2. Fourth graders averaged at the 65th percentile in mathematics and reading and the 59th percentile in language on the CTBS.

3. Eighth graders averaged at the 72nd percentile in mathematics, the 64th percentile in reading, and the 62nd percentile in language on the CTBS.

4. Eleventh graders averaged at the 67th percentile in mathematics, the 61st percentile in reading, and the 60th percentile in language.

5. While many Wisconsin students scored higher than the national average, approximately 35 percent of the fourth graders, 33 percent of the eighth graders, and 37 percent of the eleventh graders scored below the national average.

SCIENCE

SCIENCE ASSESSMENT BACKGROUND

In March of 1982, random samples of approximately 6,500 eighth and eleventh grade public school students were tested in science.

As part of the overall assessment of science, two additional pieces of information were gathered:

1. Random samples of Wisconsin science teachers were surveyed and asked to judge both the importance of, and teaching emphasis given to, a list of selected instructional objectives in science. Included in that list were the objectives on the science assessment test.

2. Students tested were asked to answer several questions concerning their attitudes toward science, experiences in science, and future plans for science education.

Domains and Objectives

The Wisconsin science assessment, as developed by a committee of Wisconsin science educators, is unique because it does not attempt to assess student knowledge of specific scientific disciplines. Rather, the Wisconsin science assessment was designed to measure student understanding of two components of science education: The Nature of Science and Science and Society.

Within these two domains, eleven instructional objectives were identified by the educators who developed the test.*

Students Sampled

In the 1982 assessment, two sample groups of eighth grade students and two sample groups of eleventh grade students were chosen. Each sample group took either the Nature of Science or Science and Society part of the test. The tests were identical at both grade levels.

*The science test objectives, a restatement of each objective, and a sample item representative of each objective are presented on pages 22-27.

Science Workshop

As part of the process of analyzing and reporting the science results, the Wisconsin Department of Public Instruction sponsored a workshop which was held during the week of July 12, 1982 at the University of Wisconsin System Field Station at Pigeon Lake. A committee of Wisconsin science educators was asked to:

1. Review and analyze the 1982 Wisconsin Pupil Assessment science test scores and student questionnaire data.

2. Review and analyze the data from the science teacher survey that was conducted in February 1982 by the Pupil Assessment Program.

3. Make observations and develop recommendations in the area of science curriculum and instruction.

The results of the workshop concerning the science assessment test, student questionnaire, and teacher survey are summarized in this report. Also included are curricular and instructional recommendations suggested by the committee.

RESULTS OF THE OBJECTIVE-REFERENCED SCIENCE TEST

Eleventh grade students scored higher than eighth grade students on all test objectives. Eleventh graders averaged 70 percent correct; eighth graders averaged 59 percent correct. Performance was not uniform on all eleven test objectives.

The Nature of Science

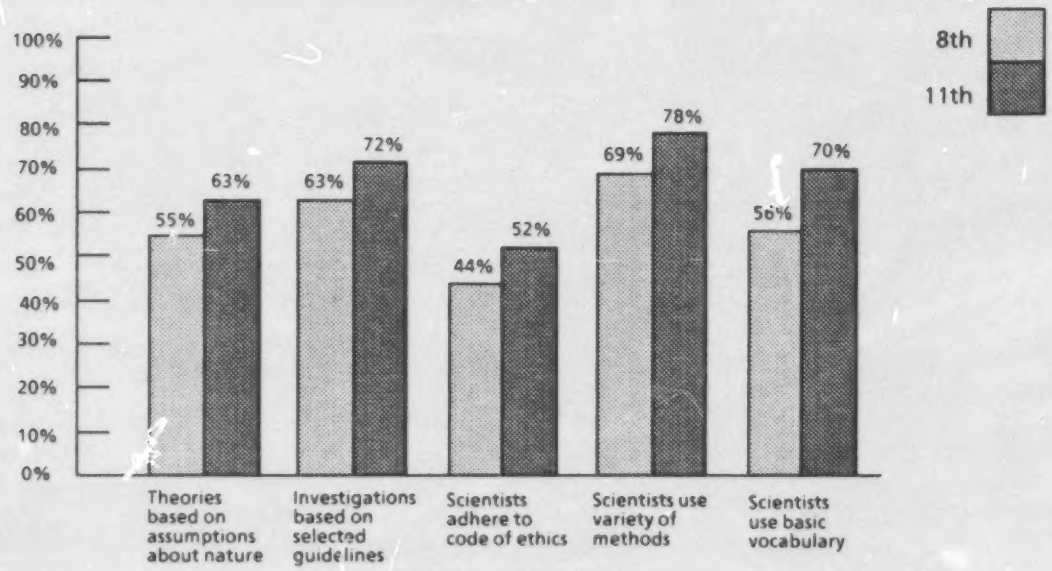
Both eighth and eleventh grade students scored highest on the objective: scientists solve problems using a variety of methods to expand knowledge. Students at both grade levels scored lowest on the objective: scientists operate within a code of ethics.

The scores on these two objectives are not only the highest and the lowest scores on the Nature of Science part of the test, but also the highest and the lowest scores on the entire test.

THE NATURE OF SCIENCE

Percent of Items Correct, By Objective

Grades 8 and 11



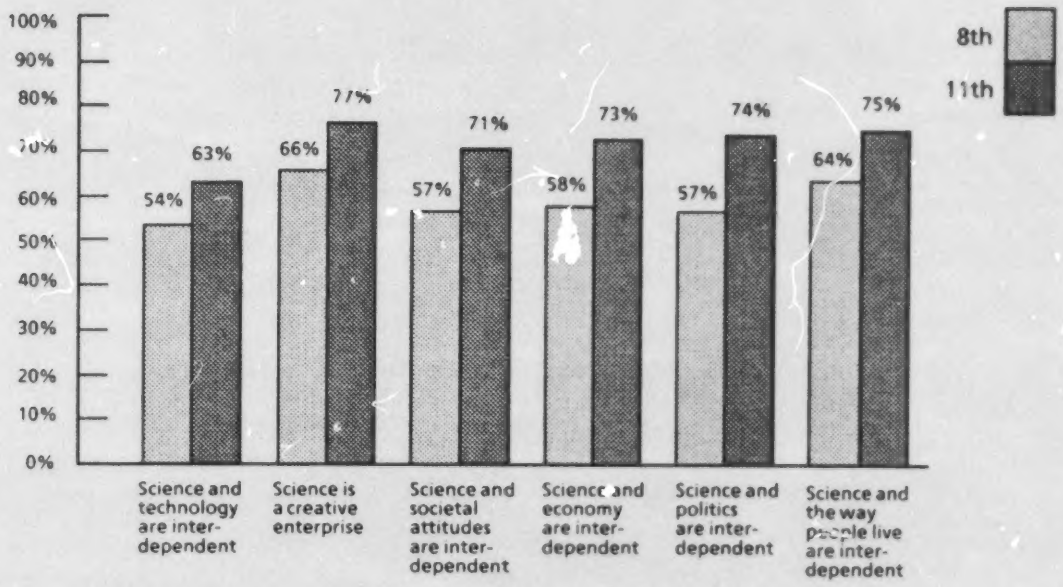
Science and Society

The highest score for both eighth and eleventh grade students on this part of the test is on the objective: science is a creative enterprise that has aesthetic value for scientists and for society. The lowest score for both grade levels is on the objective: science and technology are interdependent activities that have similarities and differences.

SCIENCE AND SOCIETY

Percent of Items Correct, By Objective

Grades 8 and 11



RESULTS OF THE SCIENCE TEST STUDENT QUESTIONNAIRE

Included on the 1982 eighth and eleventh grade objective-referenced science test were seven questions asking students about their attitudes toward science, experiences in science, and future plans for science education. Eighth grade students were asked to answer one additional question about their plans for science education in high school.

These questions are presented on the following pages in the same order in which they were asked. Following each question is a brief interpretation of student questionnaire responses compared with the students' performance on the science test. These interpretations are presented separately for eighth and eleventh grade students and are based on observations made by a committee of science educators and Pupil Assessment staff.

Question 1

Which best describes how you feel about science and science courses?

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. It is one of my favorite subjects.	20	63	65
2. I like it about the same as my other subjects.	55	59	59
3. It is one of my least favorite subjects.	24	53	56
4. No response	1	--	--
Eleventh Grade			
1. It is one of my favorite subjects.	18	75	81
2. I like it about the same as my other subjects.	47	69	72
3. It is one of my least favorite subjects.	32	64	68
4. No response	3	--	--

Approximately one-fifth of eighth and eleventh grade students consider science to be one of their favorite subjects. These students scored higher on both the Nature of Science and Science and Society parts of the test than students who responded otherwise.

A greater percentage of eleventh grade students (32%) than of eighth grade students (24%) consider science to be one of their least favorite subjects. These students scored lower on both parts of the test than students who indicated otherwise.

Question 2

How much time during an average week in school do you spend in your science classes discussing how science relates to social, economic, or political problems?

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Often (more than 30 minutes in a week)	20	55	57
2. Sometimes (about 15-30 minutes in a week)	37	59	59
3. Seldom (less than 15 minutes in a week)	41	59	62
4. No Response	1	--	--
Eleventh Grade			
1. Often (more than 30 minutes in a week)	19	68	74
2. Sometimes (about 15-30 minutes in a week)	35	69	73
3. Seldom (less than 15 minutes in a week)	43	68	71
4. No response	3	--	--

At both the eighth and eleventh grade levels, about 20 percent of the students reported spending more than 30 minutes per week talking about how science relates to social, economic, or political problems.

However, those students who indicated spending the most time discussing these issues did not score higher, and in some cases scored lower, than students who indicated otherwise.

The percentage of the students selecting each of the three answer choices is approximately the same at both the eighth and eleventh grades.

Question 3

How much time during an average week in school do you spend using the skills and methods of science such as experimenting and problem-solving?

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Often (more than 30 minutes in a week)	36	62	62
2. Sometimes (about 15-30 minutes in a week)	37	57	59
3. Seldom (less than 15 minutes in a week)	25	55	57
4. No Response	1	--	--
Eleventh Grade			
1. Often (more than 30 minutes in a week)	41	73	77
2. Sometimes (about 15-30 minutes in a week)	30	67	72
3. Seldom (less than 15 minutes in a week)	26	63	67
4. No response	3	--	--

A greater percentage of eleventh grade students (41%) than of eighth grade students (36%) indicated spending more than 30 minutes per week using the skills and methods of science. These students scored higher on the two parts of the science test than those students who indicated spending less than 30 minutes per week on these activities.

There is a direct relationship between the time students spend on experimenting and problem-solving and students' test scores. In other words, the more time the students spend using the skills and methods of science, the higher their scores tend to be.

Question 4

How much time during an average week in school have you spent discussing what scientists believe and how scientists do their work?

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Often (more than 30 minutes in a week)	15	57	59
2. Sometimes (about 15-30 minutes in a week)	38	60	60
3. Seldom (less than 15 minutes in a week)	46	58	59
4. No Response	2	--	--
Eleventh Grade			
1. Often (more than 30 minutes in a week)	15	71	75
2. Sometimes (about 15-30 minutes in a week)	34	69	74
3. Seldom (less than 15 minutes in a week)	47	67	70
4. No response	4	--	--

Fifteen percent of eighth and eleventh grade students indicated spending more than 30 minutes per week discussing what scientists believe and how scientists do their work. At the eighth grade level, this made little difference in test performance. However, at the eleventh grade level, a positive relationship between time spent and performance is shown.

Question 5

Which of the science courses listed below do you plan to take by the time you graduate from high school? (Fill in the circles for all courses you plan to take or have taken.)

1. Advanced Science
2. Astronomy
3. Biology
4. Chemistry
5. Earth Science
6. Environmental Science
7. General Science
8. Physical Science
9. Physics

NOTE: The analysis of this question looked at test performance compared with the number of science courses which students have taken or plan to take.

No. of Science Courses Indicated	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
7-9	3	66	70
5-6	13	65	66
3-4	42	60	63
1-2	42	54	54
Eleventh Grade			
7-9	2	80	84
5-6	9	77	82
3-4	43	72	77
1-2	46	63	66

At both eighth and eleventh grade levels, there is a positive relationship between the number of science courses indicated and test scores. For example, eleventh graders taking five to six courses averaged 77 percent correct on the Nature of Science part of the test, whereas those students taking one or two courses averaged 63 percent correct.

Percentages of responses in each category at both grade levels are similar. Most responses fall in the "1-2" and "3-4" categories.

Questions 6 and 7 were asked separately, but are presented together because they are related.

Question 6

Do you plan to go to college or technical school after you graduate from high school?

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Yes	63	62	63
2. No	9	47	48
3. Not Certain	28	53	55
4. No Response	1	--	--
Eleventh Grade			
1. Yes	68	71	76
2. No	9	57	59
3. Not Certain	21	64	66
4. No Response	3	--	--

Question 7

If you plan to go to college or technical school, indicate how likely it is that you will major in science or a science-related area.

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Likely	16	63	66
2. Unsure	42	57	58
3. Not Likely	39	58	59
4. No Response	3	--	--
Eleventh Grade			
1. Likely	19	75	79
2. Unsure	23	69	73
3. Not likely	53	66	70
4. No Response	4	--	--

Students at both grade levels who plan to go to college or technical school tend to score higher than those who indicated "no" or "not certain." More eleventh grade students (68%) than eighth graders (63%) indicated planning to continue their education beyond high school.

Of the students who intend to continue education beyond high school, 16 percent of the eighth graders and 19 percent of the eleventh graders indicated that they were likely to major in science or a science-related area.

At the eighth grade level, 39 percent of the students reported that they were not likely to major in science or a science-related area. However, 53 percent of eleventh grade students chose this category.

Only eighth grade students were asked to complete Question 8.

Question 8

When I go to high school, I plan to take:

1. Only those science courses which are required by the high school.
2. More than the required number of science courses.

Answer Choice	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Only required science courses.	60	54	56
2. More than required science courses.	38	65	65
3. No Response	1	--	--

Over one-half (60%) of the eighth grade students indicated that they plan to take only those science courses which are required by the high school. These students scored approximately ten percentage points lower on the test than those students who plan to take more than the required number of science courses.

Performance of Boys and Girls on the Science Test

Students were asked to indicate their gender on the science test answer sheet. The following data were reported:

Gender	Percent of Responses	Percent Correct on Test	
		Nature of Science	Science and Society
Eighth Grade			
1. Boys	49	57	60
2. Girls	51	60	59
Eleventh Grade			
1. Boys	47	67	72
2. Girls	53	70	72

On the Nature of Science part of the test, girls scored three percentage points higher than boys at both grade levels.

On the Science and Society part of the test, girls scored the same as boys at the eleventh grade. At eighth grade, girls scored one percentage point lower than boys.

Comparison of Responses of Girls and Boys on Selected Student Questionnaire Items

Question

Which best describes how you feel about science and science courses?

Answer Choice	Percent of Responses	
	Boys	Girls
1. It is one of my favorite subjects.	25	14
2. I like it about the same as other subjects.	53	51
3. It is one of my least favorite subjects.	22	35

A greater percentage of boys (25%) than girls (14%) indicated that science is one of their favorite subjects.

Further, 22 percent of boys and 35 percent of girls indicated that science is one of their least favorite subjects.

Question 6

Do you plan to go to college or technical school after you graduate from high school?

Answer Choice	Percent of Responses	
	Boys	Girls
1. Yes	62	71
2. No	11	7
3. Not Certain	28	22

Question 7

If you plan to go to college or technical school, indicate how likely it is that you will major in science or science-related area.

Answer Choice	Percent of Responses	
	Boys	Girls
1. Likely	19	18
2. Unsure	35	33
3. Unlikely	46	50

Of the students who participated in the science assessment test, 62 percent of the boys and 71 percent of the girls indicated that they plan to go to college or technical school upon graduation from high school.

However, 19 percent of the boys and 18 percent of the girls who plan to continue education beyond high school indicated that they are likely to major in science or science-related area.

Question 8

(Only eighth grade students were asked to answer this question.)

When I go to high school I plan to take:

Answer Choice	Percent of Responses	
	Boys	Girls
1. only those science courses which are required by the high school.	57	65
2. more than the required number of science courses.	43	35

Of the students who participated in the science assessment test, a greater number of girls (65%) than boys (57%) indicated that they plan to take only those science courses that are required by the high school. However, 43 percent of the boys and 35 percent of the girls indicated that they plan to take more than the required number of science courses.

RESULTS OF THE SCIENCE TEACHER SURVEY

The eleven objectives that were used in the Wisconsin science assessment were included among thirty-nine objectives in a two-part survey. In February 1982, a random sample of 1,200 science teachers was chosen to rate the objectives and answer a variety of related questions about themselves and their school districts. Six hundred science teachers were asked to rate the thirty-nine objectives as to how important they felt each objective was, using the following scale:

1. Very unimportant
2. Moderately unimportant
3. About average in importance
4. Moderately important
5. Very important

A separate sample of six hundred science teachers were asked to rate the thirty-nine objectives according to how much emphasis they gave each objective in their classroom teaching, using the following scale:

1. Little or no attention
2. Occasional attention
3. A great deal of attention

For purposes of this report, only the teachers' rating of the eleven test objectives will be discussed.

Survey Results

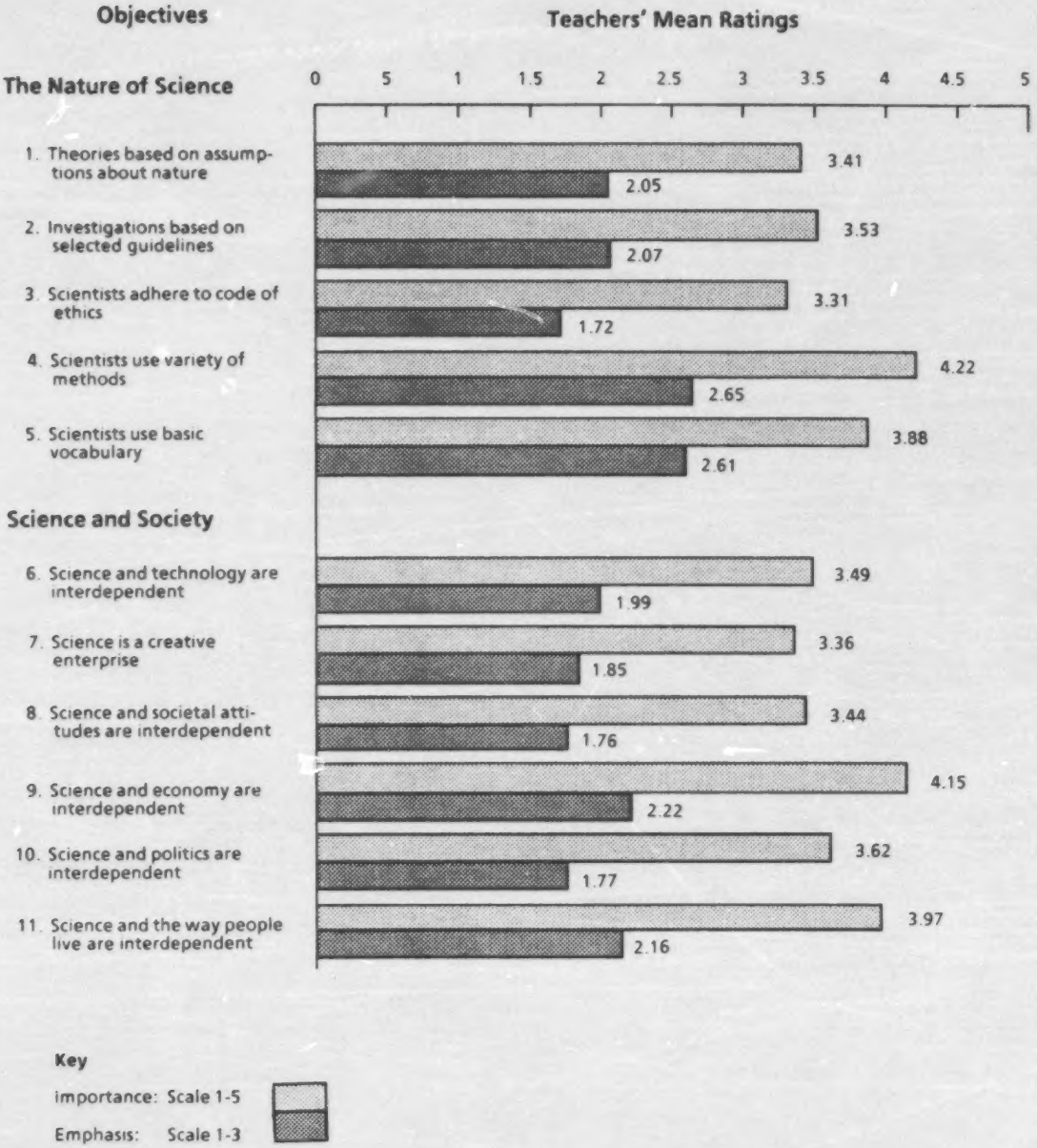
The mean ratings of the importance of the test objectives and the emphasis of these objectives in classroom teaching are presented on the following page.

Science educators who compared teacher survey responses with student test performance, made two important observations:

- Students at eighth and eleventh grade levels scored highest on the objective that teachers considered the most important and emphasized the most in their classroom teaching. This objective states that the student shall understand that scientists solve problems using a variety of methods to expand knowledge.

- Students at both grade levels scored lowest on the objective that teachers considered the least important and emphasized the least in their classroom teaching. This objective states that the student shall understand that scientists operate within a code of ethics.

TEACHERS' MEAN RATINGS OF IMPORTANCE AND EMPHASIS OF SCIENCE TEST OBJECTIVES



SCIENCE TEST OBJECTIVES AND SAMPLE ITEMS

The science test objectives, a restatement of each objective, and a sample item representative of each objective are presented below. The restatement of objectives is presented so that they are understandable to those whose background and training is not in science or a science-related area.

Part 1: The Nature of Science

Objective 1

The student shall understand that scientists base theories on assumptions about nature.

Restatement:

The student shall understand that scientific theories are based upon well-supported assumptions about nature. Scientists assume that the universe is real and not imagined and that natural events are predictable. Scientists also assume that natural events have natural causes and that human beings are capable of understanding these relationships.

Sample Item:

Scientists believe that everything that happens in nature

(A) has a natural cause.
B. happens at a predictable time.
C. happens for unknown reasons.
D. happens at an unpredictable time.

74% of 8th and 80% of 11th graders answered this question correctly.

Objective 2

The student shall understand that scientists operate using assumptions about the validity of the processes of investigations, about the products which result from the investigations, and about the limitations which always exist.

Restatement:

The student shall understand that scientists make assumptions about the methods they use. They assume that they can have confidence in the results of controlled, repeatable studies, but are aware of the ever-present possibility of error. They expect that scientific ideas will change as new information becomes available.

Sample Item:

Major scientific theories

A. change very often.
B. will remain the same.
(C) may change with new knowledge.
D. explain all known observations.

82% of 8th and 85% of 11th graders answered this question correctly.

Objective 3

The student shall understand that scientists operate within a code of ethics.

Restatement:

The scientific community expects its members to apply certain attitudes and values in their work. Scientists expect that investigations in science will be done without personal bias and the results will never be predetermined.

Sample Item:

A scientist is studying a new problem and develops a hypothesis. Which of the following actions would be right?

(A.) Gather data to see if the hypothesis is supported.
B. Decide what the conclusions will be.
C. Select the data which will best support the hypothesis.
D. Design the experiment so that the hypothesis is sure to be proven.

38% of 8th and 53% of 11th graders answered this question correctly.

Objective 4

The student shall understand that scientists solve problems using a variety of methods to expand knowledge.

Restatement:

The student shall understand that to expand knowledge, scientists employ various methods and know that no single procedure works best in all situations.

Sample Item:

In 1909, a scientist found a drug that cured a disease after testing 606 different chemicals. Scientists would say this is an example of

A. a poor scientific method, even though it was finally successful.
B. an out-dated scientific method.
(C.) one type of acceptable scientific method.
D. the only scientific method that is acceptable.

59% of 8th and 63% of 11th graders answered this question correctly.

Objective 5

The student shall understand basic terminology related to scientific investigation.

Restatement:

The student shall understand the basic vocabulary used by scientists. Hypothesis, theory, and observation are examples of commonly used terms.

Sample Item:

A scientist wants to find out why trout fail to reproduce in Lake Michigan. The scientist has the idea it is due to pollutants in the water. This idea is an example of

A. an observation.
B. a theory.
C. a conclusion.
(D.) a hypothesis.

39% of 8th and 56% of 11th graders answered this question correctly.

Part 2: Science and Society

Objective 6

The student shall understand that science and technology are interdependent activities that have similarities and differences.

Restatement:

The student shall understand that science and technology are both fields of research and investigation, and although they have different goals and ways of working, they depend on each other.

Sample Item:

Scientists depend on technologists for

(A.) equipment for doing experiments.
B. identification of all problems to be studied.
C. new theories about nature.
D. testing hypotheses.

48% of 8th and 52% of 11th graders answered this question correctly.

Objective 7

The student shall understand that science is a creative enterprise that has aesthetic value for scientists and for society. (Aesthetic)

Restatement:

The student shall understand that scientific investigation is a creative activity that for the individual is both intellectually challenging and satisfying.

Sample Item:

Science and the arts are <u>alike</u> because

(A.) both science and the arts involve creative activities.
B. scientists appreciate the beauty of art.
C. both scientists and artists seek to prove common beliefs.
D. both science and the arts are difficult to understand.

71% of 8th and 79% of 11th graders answered this question correctly.

Objective 8

The student shall understand that science progress is controlled by existing attitudes of society and those attitudes, in turn, are shaped by the progress of science. (Philosophical)

Restatement:

The student shall understand that the attitudes society has toward science affect the progress of science. In turn, scientific discoveries can change peoples' attitudes.

Sample Item:

Many people mistakenly believe that nuclear tests have caused serious weather problems. The most likely response of scientists would be to

A. not care what people think.
B. agree with public opinion and stop their research.
C. hide the testing program from the public.
(D.) be concerned about future support for research.

73% of 8th and 81% of 11th graders answered this question correctly.

Objective 9

The student shall understand that science and technology have a great influence on the level of national and world economic growth; in turn, economic conditions affect the progress of science and technology. (Economic)

Restatement:

The student shall understand that science and technology affect the economic conditions of all societies. In turn, economic conditions affect the progress of science and technology.

Sample Item:

New developments in technology are changing the American job market by

A. making more jobs for people with limited training.
(B.) creating high-paying jobs for people with specialized skills.
C. reducing the variety of highly technical jobs.
D. causing greater job security.

42% of 8th and 59% of 11th graders answered this question correctly.

Objective 10

The student shall understand that science and technology have a great influence on national and world politics; in turn, political conditions affect the progress of science and technology. (Political)

Restatement:

The student shall understand that government policies affect the growth of science and technology. In turn, the discoveries of scientists and technologists affect the workings of government.

Sample Item:

Which government policy would best convince people to accept and use new technology, such as solar water heaters?

A. Increasing the interest rate charged by banks
B. Refusing to support general research in science and technology
C. Controlling the exports of this technology to other countries
(D.) Reducing people's taxes when they use the new technology

59% of 8th and 80% of 11th graders answered this question correctly.

Objective 11

The student shall understand that scientific and technological developments affect the lives of the individuals and, in turn, the response to new developments by society affects the direction of further research and development. (Sociological)

Restatement:

The student shall understand that science and technology affect, both positively and negatively, the way people live. In turn, the needs and demands of the public affect research and development.

Sample Item:

Scientific discoveries have led to inventions like the gasoline engine, pesticides, plastics, and nuclear power. The effects of these discoveries show us that scientific discoveries

A. often result in harm and should be controlled.
B. bring benefits and should be used freely.
(C.) can bring both harm and benefit and should be applied carefully.
D. have limited influence on the environment.

74% of 8th and 89% of 11th graders answered this question correctly.

SUMMARY OF SCIENCE
CURRICULAR AND INSTRUCTIONAL RECOMMENDATIONS

Based on an analysis of the 1982 statewide assessment of science, student questionnaire responses, and teacher survey responses, recommendations for improving science instruction in Wisconsin have been developed. These recommendations were drafted originally by participants in the Science Assessment Workshop in July, 1982, and have been approved by the Executive Committee of the Wisconsin Society of Science Teachers (WSST).

1. The fact that girls generally scored higher than boys on the statewide science assessment should be communicated so that girls will be encouraged to continue in science.

2. Teacher education institutions and school inservice programs should stress the importance of each of the objectives on the statewide science test and encourage teachers to integrate these objectives into their classroom instruction. In turn, teachers should make a conscientious effort to emphasize all eleven test objectives in their classroom teaching.

3. Teachers and school administrators need to be aware of the fact that the development of positive attitudes toward science may enhance achievement in the areas of the nature of science and the interaction of science with society. Schools should design and implement programs which will improve students' attitudes toward science. This may include the adoption of new instructional materials and teaching strategies which involve the two areas of understanding included in the test.

4. What scientists believe; how they do their work; and how science relates to society's social, economic, and political problems appear to be difficult concepts to understand, especially for younger students. For this reason, classroom discussions in these areas need to be carefully structured so that students understand the ideas being presented.

5. Students at all grade levels should participate actively, at least 30 minutes each week, in using skills and methods of science, such as doing experiments and solving problems.

6. School districts should give serious consideration to increasing the number of science courses required for graduation. At the same time, efforts should be made to encourage students to elect higher level science courses.

MATHEMATICS

MATHEMATICS ASSESSMENT BACKGROUND

In March of 1982, the Wisconsin Pupil Assessment Program of the Department of Public Instruction administered objective-referenced mathematics tests to random samples of nearly 10,000 fourth, eighth, and twelfth grade Wisconsin public school students. The mathematics assessment consists of tests in two areas, as described below:

Computation/Applications

These tests assessed students' ability to add, subtract, multiply, and divide and to apply these operations to everyday situations. Fourth graders were tested only on whole numbers. The test which was administered to both eighth and twelfth graders contained whole numbers, decimals, and fractions.

Geometry/Number Sentences

A test assessing both geometry and number sentence skills was given to fourth graders. Eighth and twelfth graders were given a test measuring geometry skills only.

The objective-referenced mathematics tests were developed by Wisconsin mathematics educators. The test objectives were selected because they are taught in nearly all Wisconsin schools.

The Computation/Applications tests were administered first in 1976. The Geometry and Geometry/Number Sentence tests were administered first in 1979.

Although these mathematics tests have been revised and updated, several common items have been retained for comparison purposes.

The results of the 1982 mathematics assessment, as well as comparisons of test scores from previous assessments appear on pages 30-49 of this report.

RESULTS OF THE OBJECTIVE-REFERENCED MATHEMATICS TESTS

Computation/Applications Results: 1982

Fourth Grade

The fourth grade Computation/Applications test consists of 67 items measuring 16 learning objectives. Test items at this grade level required students to work only with whole numbers. In the 1982 statewide assessment, fourth grade students averaged 78% correct on the entire test.

Computation

On whole number computation objectives, students scored highest on multiplying basic facts (93% correct) and lowest on dividing with no regrouping or remainder (68% correct).

Scores on the two subtraction objectives were 88 percent correct on subtraction without regrouping and 78 percent correct on items requiring regrouping.

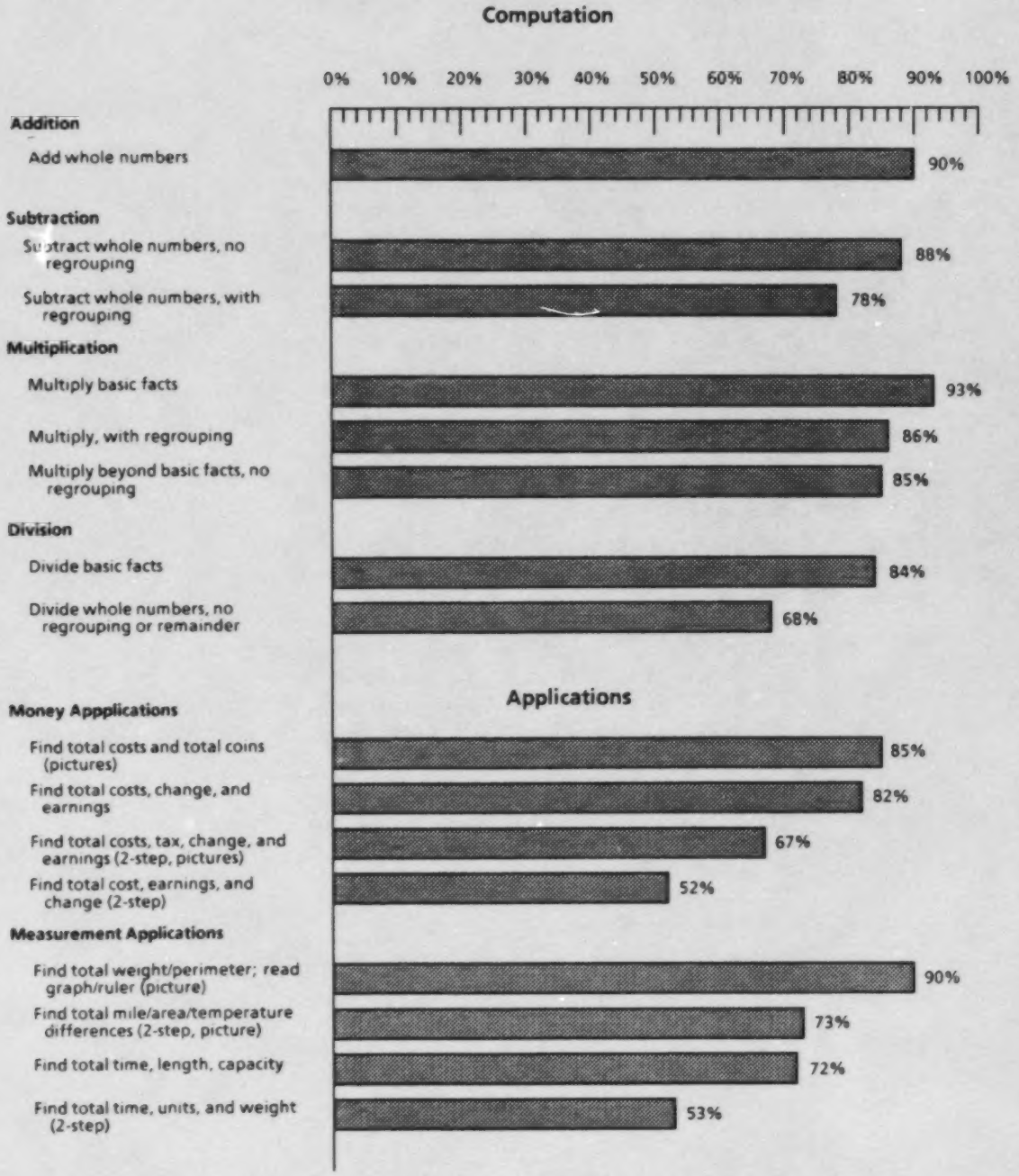
A similar range of scores was evident also on the two division objectives. The score on dividing basic facts was 84 percent correct, while the score on dividing with no regrouping or remainder was 68 percent correct.

Applications

On objectives asking students to apply whole number computation skills to real life situations, scores of fourth graders ranged from a high of 90 percent correct to a low of 52 percent correct. The objective on which students scored the highest was finding total weight/perimeter or reading a graph/ruler (using pictures). Solving two-step questions to find total cost, earnings, and change resulted in the lowest score.

On the applications objectives, students scored highest on one-step items with pictures. The lowest scores on applications items occurred on two-step questions without pictures.

FOURTH GRADE PERCENT CORRECT, BY OBJECTIVE



Eighth Grade

The eighth and twelfth grade Computation/Applications test consists of 88 items measuring 21 learning objectives. Eighth graders averaged 73 percent correct on the test.

Computation

On computation objectives, eighth grade students scored highest on multiplying and dividing whole numbers (87% correct). They scored 86 percent correct on adding and subtracting whole numbers.

Eighth graders also scored 86 percent correct on adding terminating decimals. However, on subtracting decimals with regrouping, they averaged eight percentage points lower (78% correct).

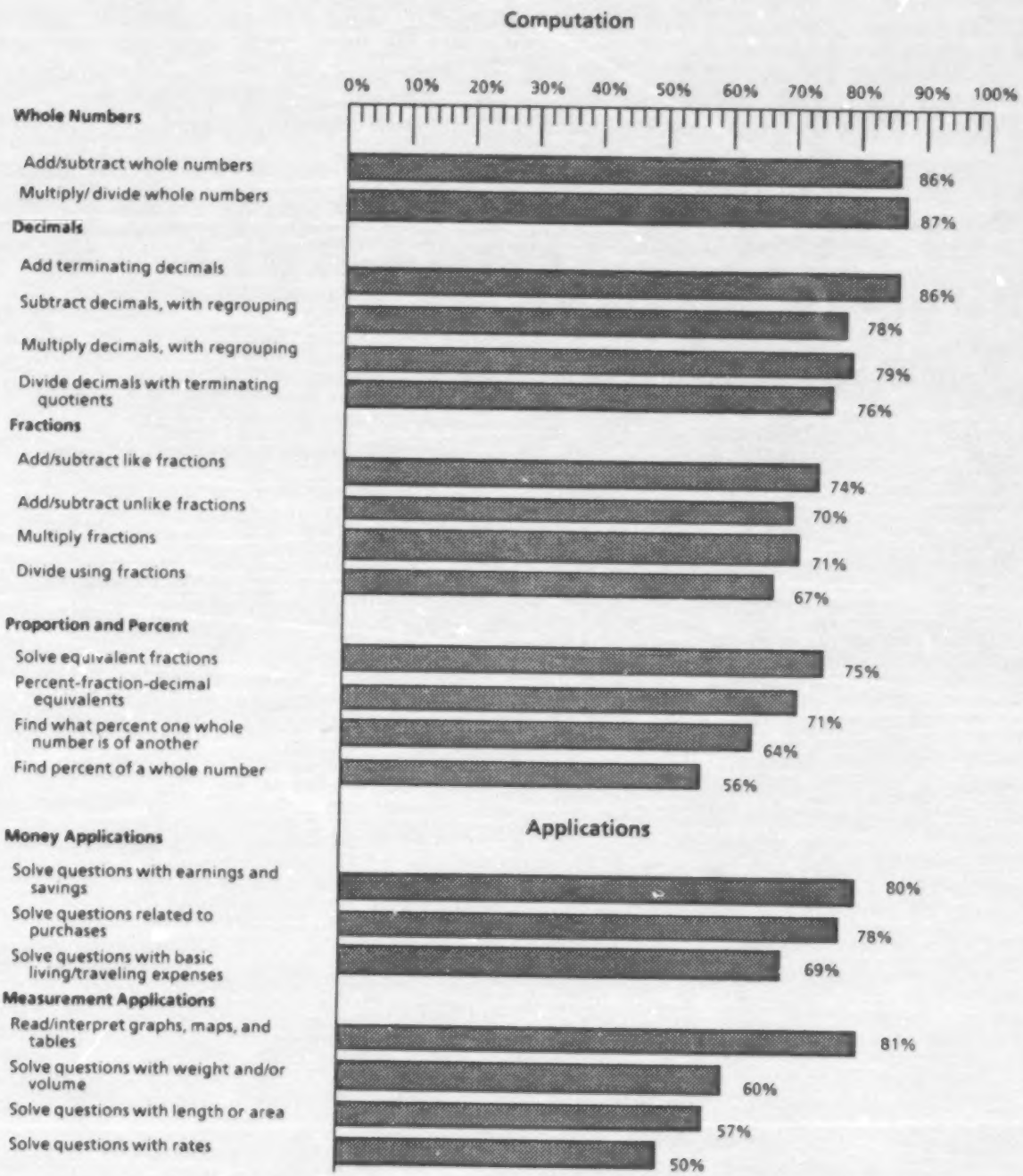
The lowest score (56% correct) on eighth grade computation occurred on the objective asking them to find percent of a whole number.

Applications

On money applications, scores ranged from 80 percent correct on solving questions with earnings and savings to 69 percent correct on solving questions with basic living and traveling expenses.

The highest score (81% correct) on measurement applications occurred on the objective which asked students to read and interpret graphs, maps, and tables. The lowest score on the measurement applications objectives and on the entire test was 50 percent correct on solving questions with rates.

EIGHTH GRADE PERCENT CORRECT, BY OBJECTIVE



Twelfth Grade

The twelfth grade Computation/Applications test is identical to the eighth grade test. It has 88 items measuring 21 objectives. Twelfth graders averaged 80 percent correct on the test, seven percentage points higher than eighth graders.

Computation

On computation objectives, twelfth grade students scored highest on addition and subtraction of whole numbers (89% correct); this was three percentage points higher than eighth graders. Both eighth and twelfth graders averaged 87 percent correct on multiplication and division of whole numbers.

The lowest score for twelfth graders on the computations objectives was 67 percent correct on finding percent of a whole number. Eighth graders scored 56 percent on this objective, 11 percentage points lower than twelfth graders.

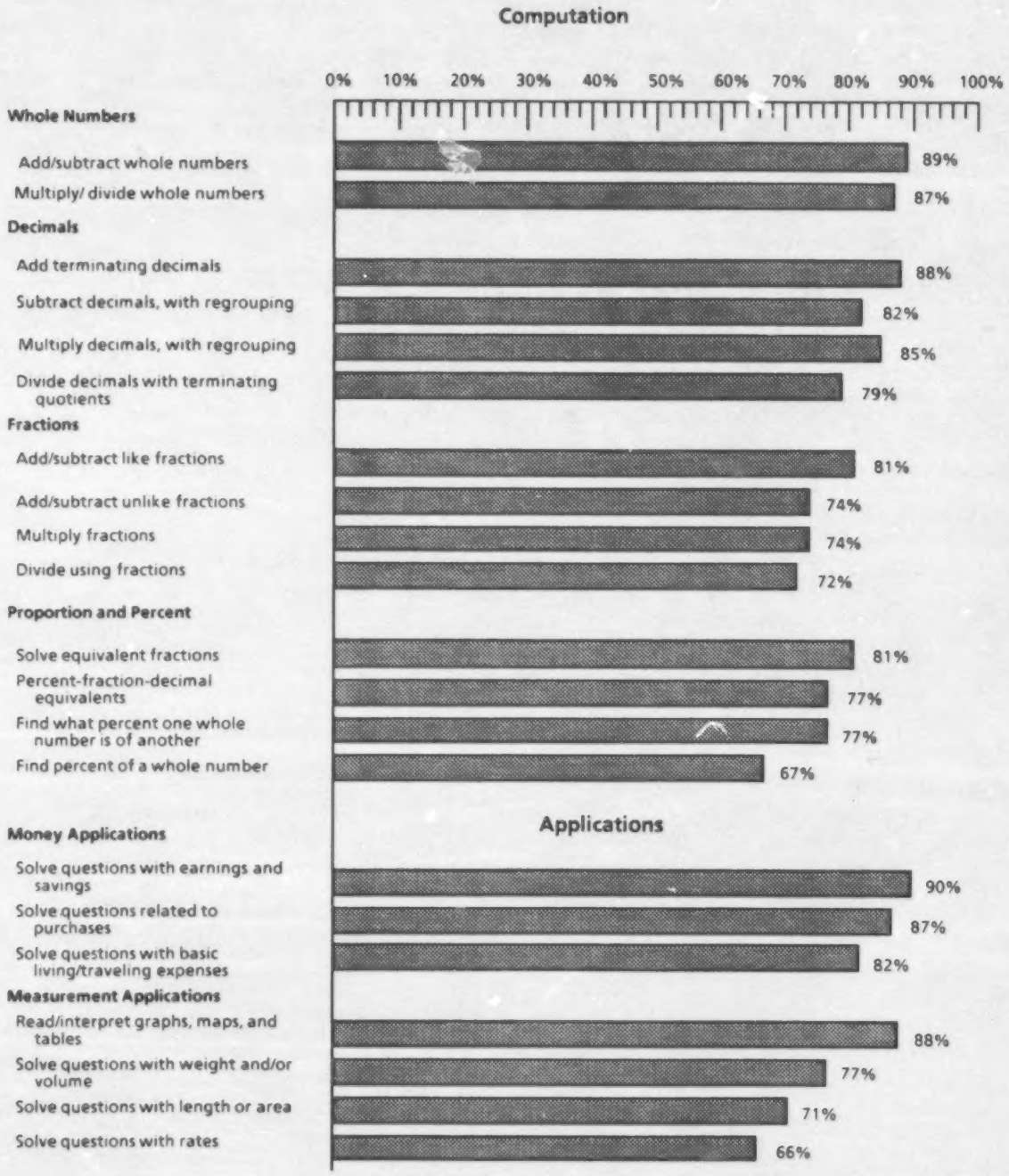
The greatest difference in scores between the two grades was on finding what percent one whole number is of another. Twelfth graders scored 13 percentage points higher than eighth graders (77% and 64% correct, respectively).

Applications

On the applications objectives, twelfth grade students scored highest (90% correct) on solving problems with earnings and savings. Eighth graders scored 80 percent correct on this objective.

The applications objective on which twelfth graders scored the lowest (66% correct) was solving questions with rates. The score for eighth graders on this objective was 50 percent correct, 16 percentage points lower than twelfth graders.

TWELFTH GRADE PERCENT CORRECT, BY OBJECTIVE



Geometry and Number Sentences Results: 1982

Fourth Grade

The fourth grade Geomentry test has 24 items measuring six objectives. The Number Sentences test has 29 items measuring seven objectives.

Fourth graders averaged 85% correct on the geometry test and 78% correct on the number sentences test.

Geometry

On the Geometry test, fourth grade students scored highest (94% correct) on items requiring them to identify congruent figures. They scored 91% correct on identifying similar figures.

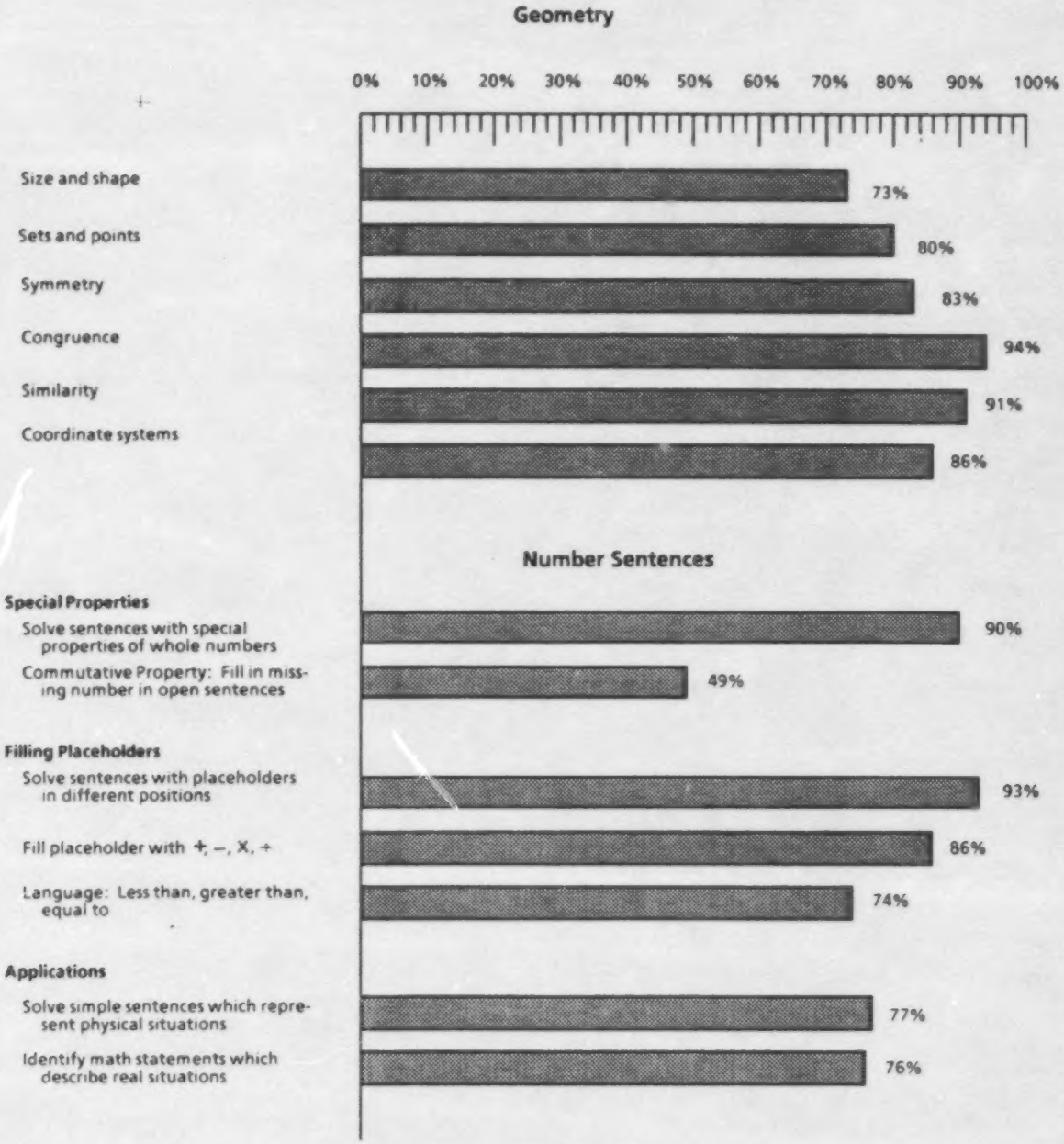
Students scored lowest (73% correct) on size and shape questions requiring identification of special figures, such as a right triangle.

Number Sentences

On the Number Sentences test, fourth graders scored highest on the objective which asks students to solve sentences with placeholders in different positions. The average score on this objective was 93% correct.

The lowest score (49% correct) occurred on items involving understanding the commutative property.

FOURTH GRADE PERCENT CORRECT, BY OBJECTIVE



Eighth Grade

The Geometry test which is administered to both eighth and twelfth grade students consists of 60 items measuring 15 objectives. Eighth graders averaged 67 percent correct.

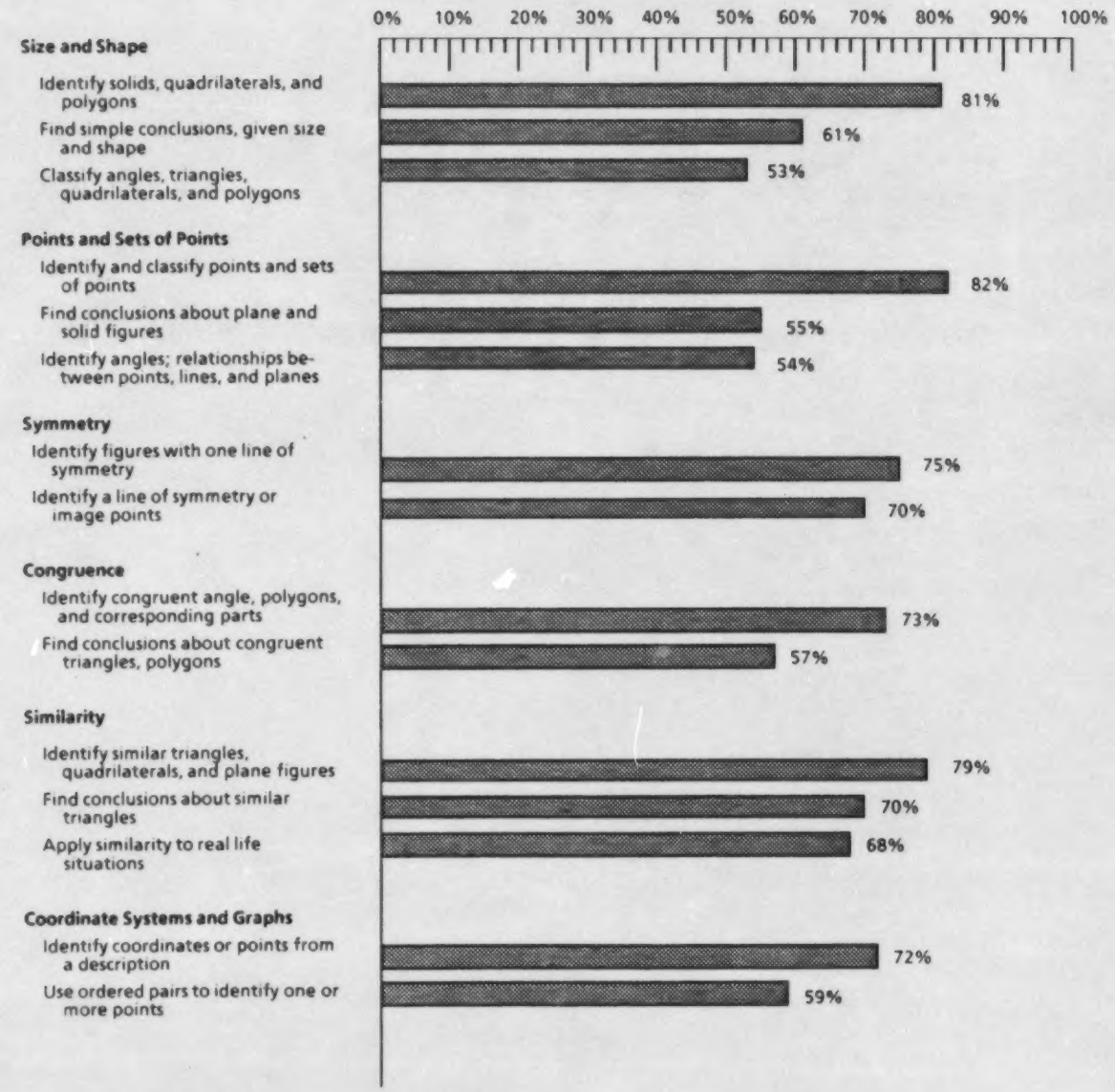
Eighth grade students scored highest (82% correct) on identifying and classifying points and sets of points. They scored 81 percent correct on identifying solids, quadrilaterals, and polygons.

The lowest score (53% correct) occurred on the objective which asked students to classify angles, triangles, quadrilaterals, and polygons.

A range of scores was evident in the area of "points and sets of points". The high score was 82% correct on identifying and classifying points and sets of points. The low score was 54% on identifying angles and relationships between points, lines, and planes.

EIGHTH GRADE PERCENT CORRECT, BY OBJECTIVE

Geometry



Twelfth Grade

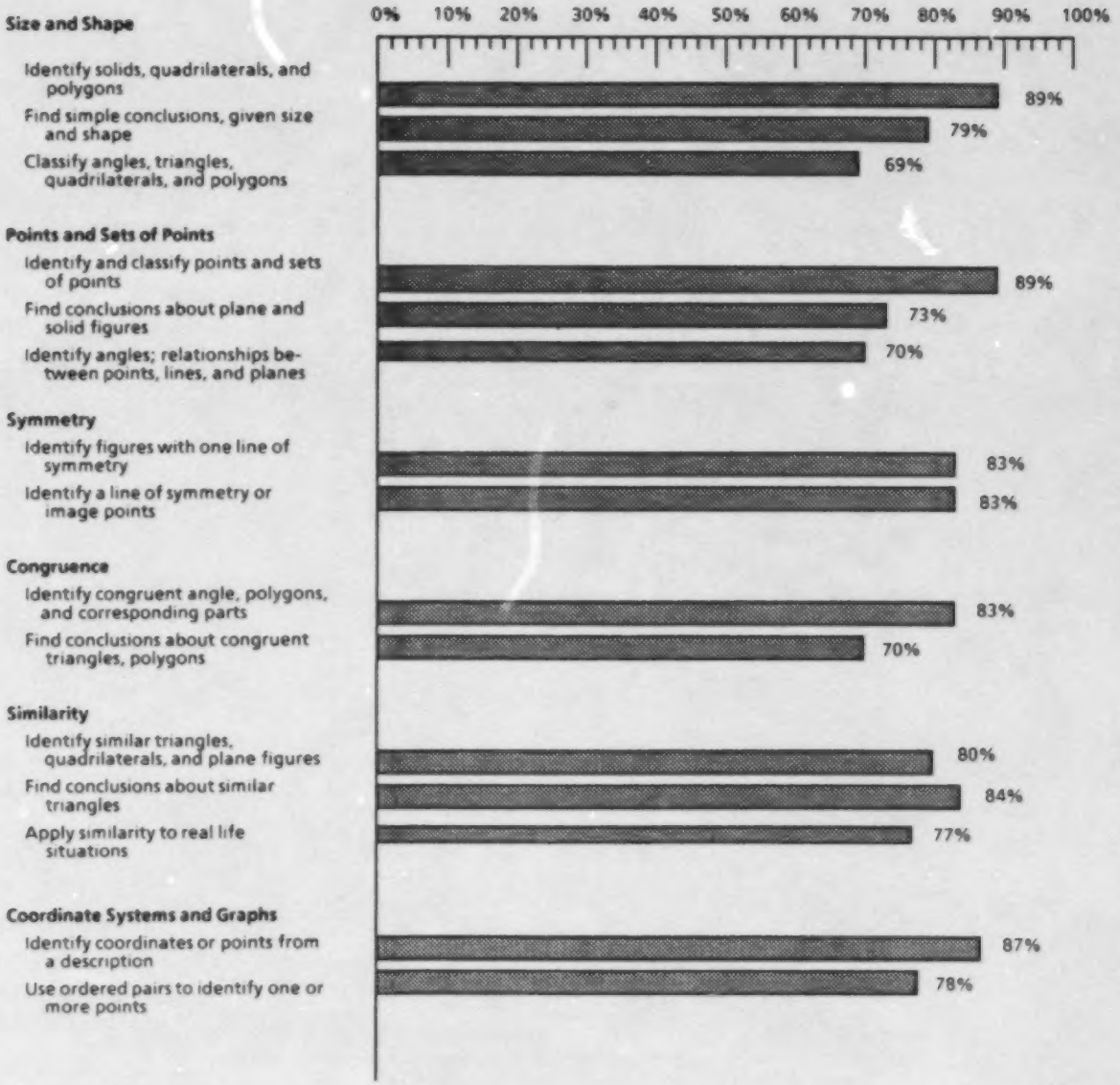
The twelfth grade Geometry test is the same test which is administered to eighth grade students. The test has 60 items and 15 objectives. Twelfth graders, with an average score of 80% correct, averaged 13 percentage points higher than eighth graders. Generally, the seniors have the same strengths and weaknesses as eighth graders.

Like eighth graders, twelfth graders scored highest on identifying and classifying points and sets of points. On this objective, twelfth graders scored 89 percent correct, and eighth graders scored 82 percent correct. Twelfth grade students also scored 89 percent correct on identifying solids, quadrilaterals, and polygons. The score for eighth grade students on this objective was 81 percent correct.

The lowest scores at both the eighth and twelfth grade level occurred on the objective asking students to classify angles, triangles, quadrilaterals, and polygons. Twelfth graders averaged 69 percent correct; eighth graders, 53 percent.

TWELFTH GRADE PERCENT CORRECT, BY OBJECTIVE

Geometry



COMPARISON OF RESULTS ON MATHEMATICS TEST OBJECTIVES WITH STATEWIDE AVERAGES

Computation/Applications

In the 1982 mathematics assessment, student performance was not uniform on all test objectives. The following is a listing of students' average scores for each objective on the Computation/Applications and Geometry/ Number Sentences test. Objectives on which students scored above the overall test average are indicated, as are objectives on which students scored below the overall test average.

Fourth Grade

In the 1982 assessment, fourth graders averaged 78 percent correct on the Computation/Applications test. Objectives on which students scored at or above the statewide average are listed below:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Multiply basic facts	93%
Add whole numbers	90%
Find total weight/perimeter; read graph/ruler (pictures)	90%
Subtract whole numbers, no regrouping	88%
Multiply with regrouping	86%
Multiply beyond basic facts, no regrouping	85%
Find total costs and total coins (pictures)	85%
Divide basic facts	84%
Find total cost, change, and earnings	82%
Subtract whole numbers, with regrouping	78%

On six of the test objectives, fourth graders averaged less than the statewide average of 78% correct:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Find total mile/area/temperature difference (2-step pictures)	73%
Find total time, length, and capacity	72%
Divide whole numbers, no regrouping or remainder	68%
Find total cost, tax, change, and earnings (2-step pictures)	67%
Find total time, units, and weight (2-step)	53%
Find total cost, earnings, and change (2-step)	52%

Eighth Grade

Eighth grade students averaged 73 percent correct on the 1982 statewide Computation/Applications assessment test. On 11 of the 21 test objectives, eighth graders scored above the statewide average:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Multiply/divide whole numbers	87%
Add/subtract whole numbers	86%
Add terminating decimals	86%
Read/interpret graphs, maps, tables	81%
Solve questions with earnings and savings	80%
Multiply decimals with regrouping	79%
Subtract decimals with regrouping	78%
Solve questions related to purchases	78%
Divide decimals with terminating quotients	76%
Solve equivalent fractions	75%
Add/subtract like fractions	74%

On 10 objectives, eighth graders scored below 73 percent, the statewide average:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Percent-fraction-decimal equivalents	71%
Multiply fractions	71%
Add/subtract unlike fractions	70%
Solve questions with basic living/traveling expenses	69%
Divide using fractions	67%
Find percent one whole number is of another	64%
Solve questions with weight and/or volume	60%
Solve questions with length or area	57%
Find percent of a whole number	56%
Solve questions with rates	50%

Twelfth Grade

Twelfth grade students averaged 80 percent correct on the 1982 assessment of Computation/Applications. The 11 test objectives on which twelfth graders scored above the statewide average are listed below:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Solve items with earnings and savings	90%
Add/subtract whole numbers	89%
Add terminating decimals	88%
Read/interpret graphs, maps, tables	88%
Multiply/divide whole numbers	87%
Solve items related to purchases	87%
Multiply decimals with regrouping	85%
Subtract decimals with regrouping	82%
Solve items with basic living/traveling expenses	82%
Solve equivalent fractions	81%
Add/subtract like fractions	81%

On ten of the test objectives, twelfth graders averaged below the statewide average of 80 percent correct:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Divide decimals with terminating quotients	79%
Percent-fraction-decimal equivalents	77%
Solve items with weight and/or volume	77%
Find percent one whole number is of another	77%
Add/subtract unlike fractions	74%
Multiply fractions	74%
Divide using fractions	72%
Solve items with length or area	71%
Find percent of a whole number	67%
Solve items with rates	66%

Geometry and Number Sentences

Fourth Grade Geometry

Fourth graders averaged 85% correct on the 1982 assessment of Geometry. On three of the six test objectives, students scored above the overall test average:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Congruence	94%
Similarity	91%
Coordinate systems	86%

On three of the test objectives, fourth graders scored below the overall test average:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Symmetry	83%
Sets and points	80%
Size and shape	73%

Fourth Grade Number Sentences

On the 1982 assessment, fourth grade students averaged 78 percent correct on the Number Sentences test. Students scored above the overall test average on three of the seven test objectives:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Solve sentences with placeholders in different positions	93%
Solve sentences with special properties of whole numbers	90%
Fill placeholder with +, -, x, ÷	86%

Students scored below the overall test average on four test objectives:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Solve simple sentences which represent physical situations	77%
Identify math statements which describe real situations	76%
Language: less than, greater than, equal to	74%
Commutative Property: fill in missing number in open sentences	49%

Eighth Grade Geometry

The average score for eighth graders on the 1982 Geometry assessment was 67% correct. On nine of the 15 objectives, eighth graders scored above the average:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Identify and classify points and sets of points	82%
Identify solids, quadrilaterals, polygons	81%
Identify similar triangles, quadrilaterals, plane figures	79%
Identify figures with one line or plane of symmetry	75%
Identify congruent angles, polygons, and corresponding parts	73%
Identify coordinates or points from a description	72%
Identify a line of symmetry or image points	70%
Find conclusions about similar triangles	70%
Apply similarity to real life situations	68%

Eighth grade students scored lower than the overall test average on six test objectives:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Find simple conclusion given size and shape	61%
Use ordered pairs to identify one or more points	59%
Conclusions about congruent triangles, polygons	57%
Conclusions about plane and solid figures	55%
Identify angles/relationships between points, lines, planes	54%
Classify angles, triangles, quadrilaterals, polygons	53%

Twelfth Grade Geometry

On the 1982 assessment of Geometry, twelfth graders averaged 80 percent correct. On eight of the 15 test objectives, students scored at or above the overall test average:

OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Identify solids, quadrilaterals, polygons	89%
Identify and classify points and sets of points	89%
Identify coordinates or points from a description	87%
Find conclusions about similar triangles	84%
Identify figures with one line or plane of symmetry	83%
Identify one line of symmetry or image points	83%
Identify congruent angles, polygons, and corresponding parts	83%
Identify similar triangles, quadrilaterals, plane figures	80%

Twelfth graders scored below the overall test average on the following seven objectives:

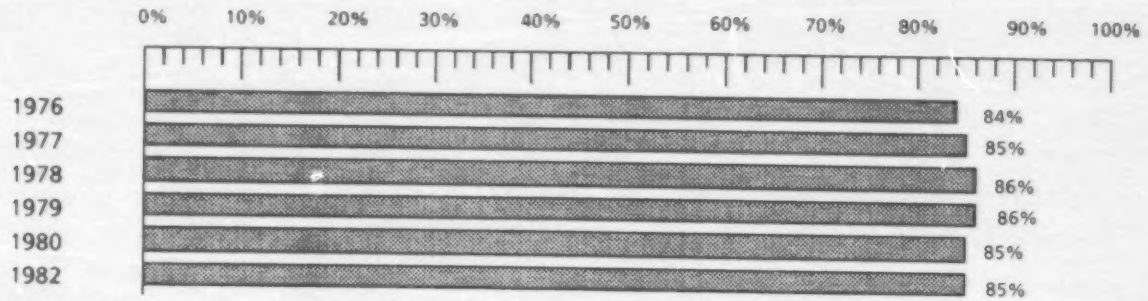
OBJECTIVE	STATE AVERAGE PERCENT CORRECT
Find simple conclusion given size and shape	79%
Use ordered pairs to identify one or more points	78%
Apply similarity to real life situations	77%
Find conclusions about plane and solid figures	73%
Identify angles/relationships between points, lines, planes	70%
Find conclusions about congruent triangles, polygons	70%
Classify angles, triangles, quadrilaterals, polygons	69%

COMPARISON OF 1976-1982 COMPUTATION/APPLICATIONS RESULTS

In order to compare test results over time, the 1976-1982 tests in computation/applications contain many of the same items. Generally, the scores on those items are very stable showing little change.

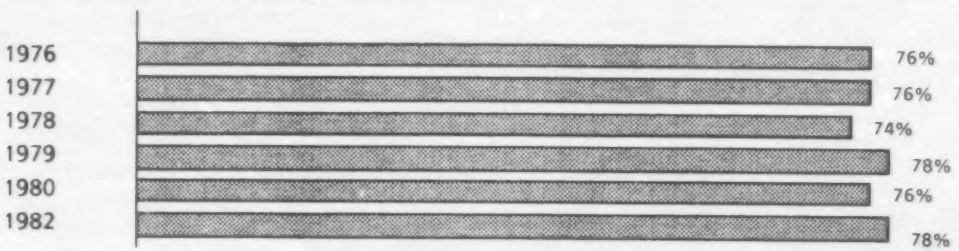
PERCENT OF ITEMS CORRECT IN COMPUTATION/APPLICATIONS: 1976-1982

FOURTH GRADE: 21 common items



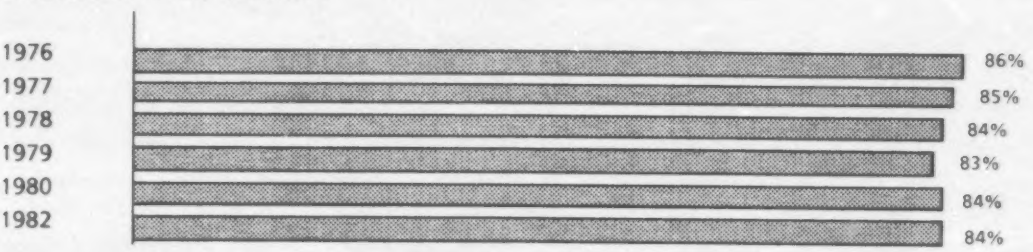
On the 1976-1982 fourth grade tests in mathematics, there are 21 common items. The scores range from 84% correct in 1976 to 86% correct in 1978 and 1979, indicating consistent performance over the six years.

EIGHTH GRADE: 36 common items



From 1976-1982, there are 36 common items on the eighth grade test in computation/applications. The scores show little variation, and range from 74% correct in 1978 to 78% correct in 1979 and 1982.

TWELFTH GRADE: 29 common items

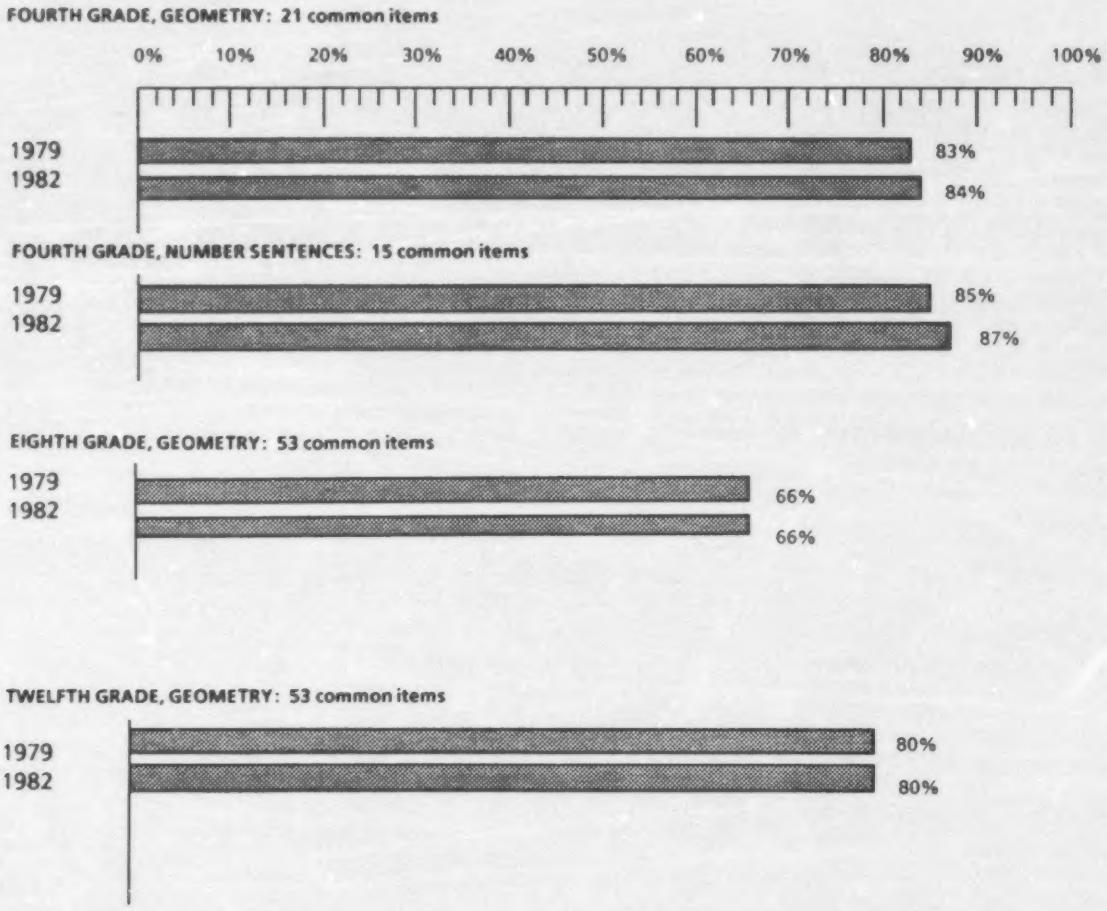


Like the fourth and eighth graders, twelfth graders' scores remained stable over the six years. The tests have 29 common items. Scores range from 83% correct in 1979 and 1980 to 86% in 1976.

COMPARISON OF 1979 AND 1982 GEOMETRY AND NUMBER SENTENCES RESULTS

No significant change in test performance of fourth, eighth, or twelfth grade students was exhibited on the items common to both the 1979 and 1982 Geometry and Number Sentences test. Results of testing are shown below:

PERCENT OF ITEMS CORRECT IN GEOMETRY AND NUMBER SENTENCES: 1979 AND 1982



MATHEMATICS TEST OBJECTIVES AND SAMPLE ITEMS

Several Computation/Applications and Geometry/Number Sentences test objectives and sample items measuring those objectives are presented on pages 50-56.

Fourth Grade Computation/Applications

Computation Objective 5:

Multiply whole numbers beyond basic facts, no regrouping.

$$\begin{array}{r} 702 \\ \times\ \ 4 \\ \hline \end{array}$$

A 2,880
(B) 2,808
C 2,480
D 2,408

87% of 4th graders answered this question correctly.

Computation Objective 8:

Divide whole numbers using the division algorithm, without regrouping or remainder.

$4\overline{)84}$

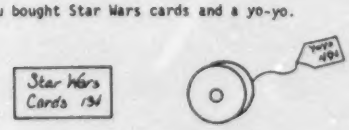
A 12
B 20
(C) 21
D 41

61% of 4th graders answered this question correctly.

Application Objective 11:

Solve multi-step pictorial problems to find total cost, tax, change, or earnings.

You bought Star Wars cards and a yo-yo.



What would be your change from a dollar?

A 26¢
(B) 38¢
C 48¢
D 62¢

39% of 4th graders answered this question correctly.

Application Objective 13:

Solve multi-step questions presented without a picture to find total cost, earnings, or change.

A babysitter begins at 7:00 p.m. and finishes at 11:00 p.m.
Babysitting pays $.75 an hour.
How much is earned?

A $2.25

B $2.75

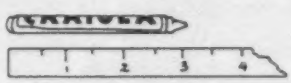
(C) $3.00

D $4.00

51% of 4th graders answered this question correctly.

Application Objective 14:

Solve simple, pictorial questions to find total weight, perimeter; or read a graph or ruler.



This crayon is about

A 6 units long

B 4¼ units long

C 4 units long

(D) 3 units long

92% of 4th graders answered this question correctly.

Fourth Grade Geometry /Number Sentences

Geometry Objective 1:

Identify pictures and terms of two-dimensional figures; classify and apply concepts of size and shape.

△ is a

A square
(B) triangle
C rectangle
D circle

95% of 4th graders answered this question correctly.

Geometry Objective 3:

Recognize, classify and apply concepts of symmetry.

Which one can be folded on the dotted line so that both parts match?

A

B

(C)

D

93% of 4th graders answered this question correctly.

Which can be folded in more than one way, so that both halves match?

A

B

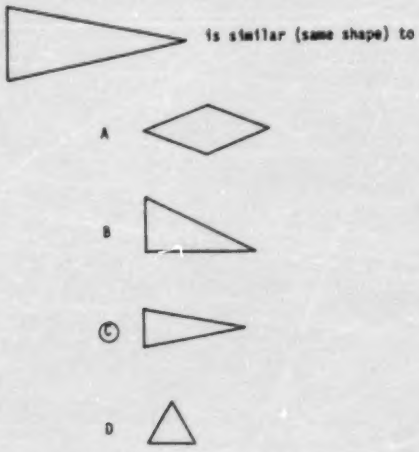
C

(D)

67% of 4th graders answered this question correctly.

Geometry Objective 5:

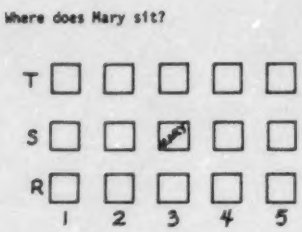
Identify similar figures, recognize the relationship between similar and congruent figures, and apply the concept to real world objects.



80% of 4th graders answered this question correctly.

Geometry Objective 6:

Number points on lines of a coordinate plane, and apply concept to real life situation.



A row R, seat 2
B row T, seat 3
C row S, seat 3
D row S, seat 4

97% of 4th graders answered this question correctly.

Number Sentences Objective 12:

Identify mathematical statements which describe realistic situations.

Six (6) children each ate 4 cookies.
How many cookies were eaten in all?

Which is like the story?

A 6 + 4 = ☐
B 6 - 4 = ☐
C 6 X 4 = ☐
D 6 ÷ 4 = ☐

61% of 4th graders answered this question correctly.

61

Eighth and Twelfth Grade Computation/Applications

Computation Objective 4:

Find the percent one whole number is of another.

40 is ___% of 100?

A 400%

B 100%

Ⓒ 40%

D 4%

74% of 8th and 83% of 12th graders answered this question correctly.

Computation Objective 14:

Divide using fractions.

25 ÷ 2 =

Ⓐ $12\frac{1}{2}$

B $12\frac{1}{25}$

C 12.1

D 2.5

84% of 8th and 89% of 12th graders answered this question correctly.

Application Objective 18:

Solve questions dealing with length or area.

A dining room ceiling is 10 feet wide and 12 feet long.

How many 1-foot-square tiles are needed to cover it?

A 10 tiles

B 22 tiles

C 44 tiles

Ⓓ 120 tiles

79% of 8th and 88% of 12th graders answered this question correctly.

Application Objective 19:

Solve questions dealing with weight and/or volume.

The Smith Package Company makes a cardboard box which is 2" long, 2" wide, and 3" high. They also make a plastic container with the same volume.

Which of the following containers <u>holds exactly the same amount</u> as the box?

A 3" long, 3" wide, 1" high

B 4" long, 2" wide, 1" high

C 1" long, 1" wide, 6" high

Ⓓ 4" long, 3" wide, 1" high

28% of 8th and 52% of 12th graders answered this question correctly.

Eighth and Twelfth Grade Geometry

Geometry Objective 7:

Identify figures with one line of symmetry.

Which letter has a line of symmetry (can be folded into two matching parts)?

A S

B P

C N

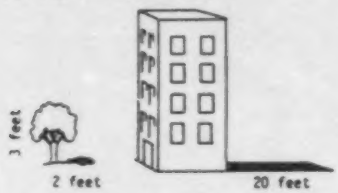
(D) D

39% of 8th and 52% of 12th graders answered this question correctly.

Geometry Objective 13:

Apply notions of similarity to real life situations.

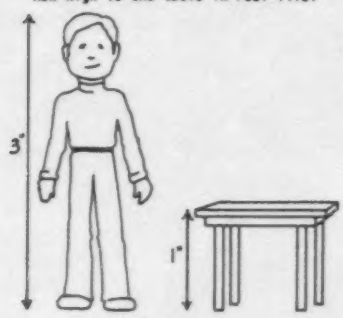
The shadow of a three foot tree is two feet, and the shadow of a building is 20 feet. How high is the building?



A 20 feet
(B) 30 feet
C 40 feet
D 60 feet

78% of 8th and 84% of 12th graders answered this question correctly.

John's height measures 3 inches in the drawing even though he is 6 feet tall in real life. The drawing of the table is only 1 inch high. How high is the table in real life?



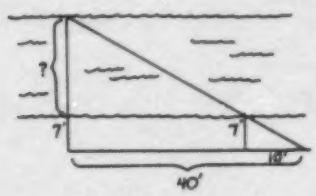
A 1 foot
(B) 2 feet
C 3 feet
D 6 feet

73% of 8th and 83% of 12th graders answered this question correctly.

Geometry Objective 13: continued

Apply notions of similarity to real life situations.

How wide is the river?



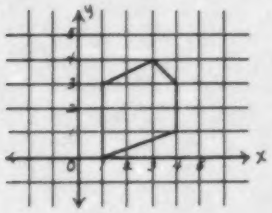
A 20'
B 21'
C 28'
D 30'

32% of 8th and 46% of 12th graders answered this question correctly.

Geometry Objective 15:

Use coordinates to identify the relationship between a point and a given figure.

Which point is outside the figure?



A (4,3)
B (3,2)
C (2,1)
D (2,4)

46% of 8th and 75% of 12th graders answered this question correctly.

COMPREHENSIVE TESTS OF BASIC SKILLS

COMPREHENSIVE TESTS OF BASIC SKILLS BACKGROUND

From 1976 through 1980, the Comprehensive Tests of Basic Skills (CTBS)* was administered to Wisconsin fourth, eighth, and twelfth grade students to determine how they compare with the national norm group. Beginning in 1981, eleventh graders instead of twelfth graders were tested. Students were tested in three subject areas: reading, language and mathematics.

The national percentile scores of the CTBS serve as the basis for comparison. National percentile scores indicate how well the average Wisconsin student performs in relation to students in a similar grade across the country.

Percentile scores range from 1-99. A percentile score of 60 means that 60 percent of the national norm group scored lower on this test than the average Wisconsin student. It does not mean that the students answered 60 percent of the questions correctly.

In addition to the median percentile scores of Wisconsin fourth, eighth, and eleventh grade students, the percentages and numbers of students in various percentile categories are presented on pages 58-60.

The percentages shown have been determined by testing a statewide sample of students. The numbers of students indicated in each percentile category are projections based on the total grade enrollment. For example, 12% of the fourth grade sample scored below the 25th percentile in reading. Because the sample is representative of all fourth graders in Wisconsin, it is reasonable to conclude that if all 51,984 fourth grade students were tested in reading, approximately 6,238 would score in this percentile category.

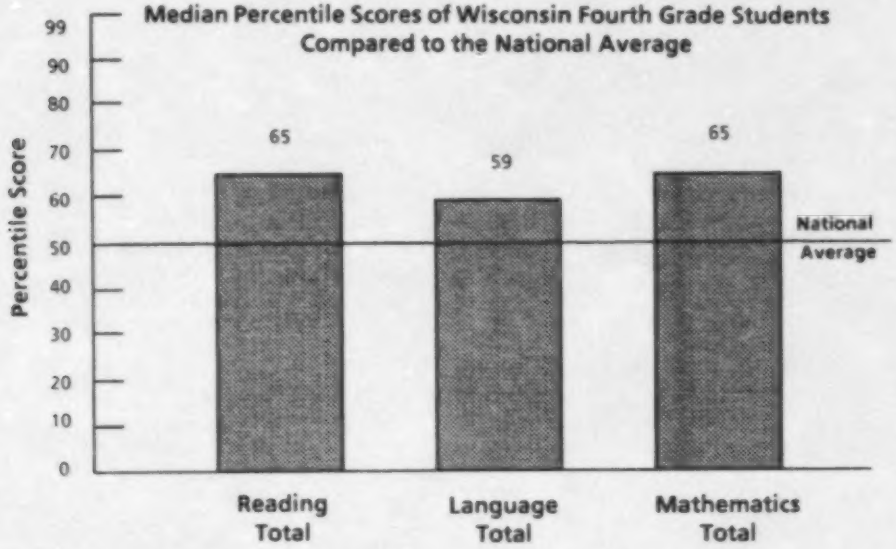
In 1982, a new edition of the CTBS was used for statewide assessment. The new edition, Form U, was normed on national samples of students in 1981; the previously used edition, Form T, was normed in 1971. Since the two tests were normed on different national sample groups, an equating study was conducted by the test publisher to relate performance on the two test forms. The equated test results for 1976-1982 are shown on pages 61-64.

*Published by CTB/McGraw-Hill

1982 CTBS RESULTS

Fourth Grade

The average fourth grader in Wisconsin scores at the 65th percentile in reading and mathematics and the 59th percentile in language. These scores average approximately 13 percentile points above the national average.



Although the average Wisconsin fourth grader scores above the national average on the CTBS reading, language, and mathematics tests, approximately 35 percent score below the national average. Projecting this figure to all Wisconsin fourth graders shows that about 18,194 students score below the national average in these subjects.

Percentages and Numbers of Wisconsin Fourth Graders Scoring in Selected Percentile Categories on the Reading, Language, and Mathematics Tests of the CTBS*

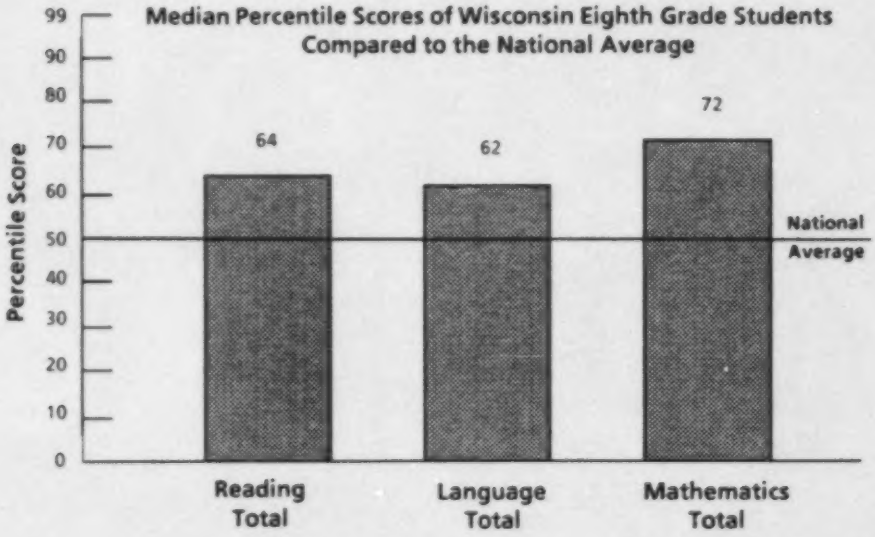
Percentile Range	Reading		Language		Mathematics	
Above 75th percentile	36%	18,714	26%	13,516	34%	17,675
51st-75th percentile	29%	15,075	35%	18,194	35%	18,194
26th-50th percentile	23%	11,956	25%	12,996	22%	11,436
Below 26th percentile	12%	6,238	14%	7,278	9%	4,679

Total Fourth Grade Enrollment = 51,984

*The figures shown in this table are projections based on the results of statewide sampling.

Eighth Grade

The average Wisconsin eighth grader scores at the 64th percentile in reading, and 62nd percentile in language, and the 72nd percentile in mathematics. These scores average about 16 percentile points above the national average.



Although the average Wisconsin eighth grader scores above the national average on the CTBS reading, language, and mathematics tests, approximately 33 percent score below the national average. Projecting this figure to all Wisconsin eighth graders shows that about 20,174 students score below the national average in these subjects.

Percentages and Numbers of Wisconsin Eighth Graders Scoring in Selected Percentile Categories on the Reading, Language, and Mathematics Tests of the CTBS*

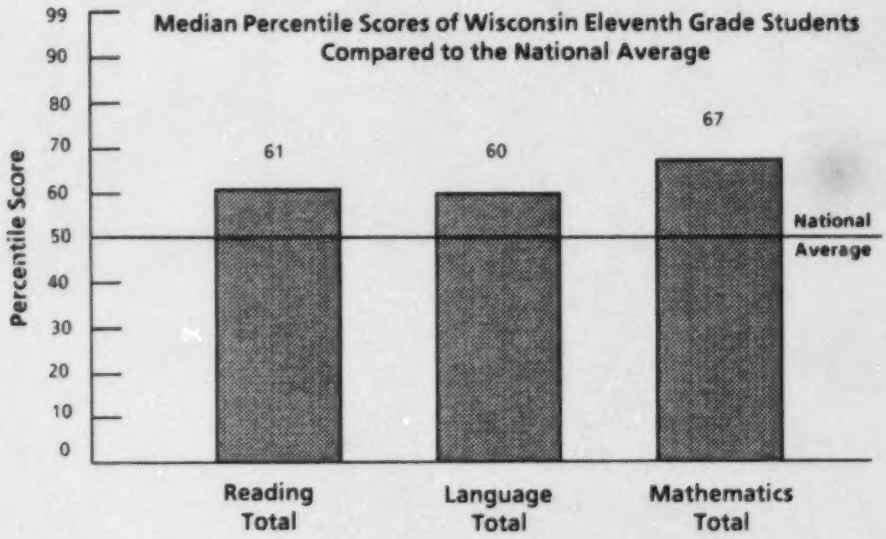
Percentile Range	Reading		Language		Mathematics	
Above 75th percentile	35%	21,397	31%	18,951	43%	26,287
51st-75th percentile	29%	17,729	32%	19,563	29%	17,729
26th-50th percentile	23%	14,061	25%	15,283	20%	12,227
Below 26th percentile	13%	7,947	12%	7,336	7%	4,279

Total Eighth Grade Enrollment = 61,133

*The figures shown in this table are projections based on the results of statewide sampling.

Eleventh Grade

The average Wisconsin eleventh grader scores at the 61st percentile in reading, the 60th percentile in language, and the 67th percentile in mathematics. These scores average about 13 percentile points above the national average.



Although the average Wisconsin eleventh grader scores above the national average on the CTBS reading, language, and mathematics tests, approximately 37 percent score below the national average. Projecting this figure to all Wisconsin eleventh graders shows that about 26,647 students score below the national average in these subjects.

Percentages and Numbers of Wisconsin Eleventh Graders Scoring in Selected Percentile Categories on the Reading, Language, and Mathematics Tests of the CTBS*

Percentile Range	Reading		Language		Mathematics	
Above 75th percentile	31%	22,326	31%	22,326	41%	29,528
51st-75th percentile	29%	20,886	29%	20,886	26%	18,725
26th-50th percentile	25%	18,005	23%	16,565	20%	14,404
Below 26th percentile	14%	10,083	17%	12,243	13%	9,363

Total Eleventh Grade Enrollment = 72,020

*The figures shown in this table are projections based on the results of statewide sampling.

COMPARISON OF 1976-1982 CTBS RESULTS

The graphs on pages 62-64 show the results at grades 4, 8, 11, and 12 on the Comprehensive Tests of Basic Skills* during the past seven years. Eleventh graders instead of twelfth graders were tested for the first time in 1981.

The graphs show the results of CTBS Form T "equated" to the newer CTBS Form U given in 1982. In other words, the percentile scores shown for 1976-1981 are the scores that Wisconsin students theoretically would have obtained had they taken the CTBS Form U.

While there is variation on each of the grade level subtests over the seven years, no clear-cut pattern is apparent.

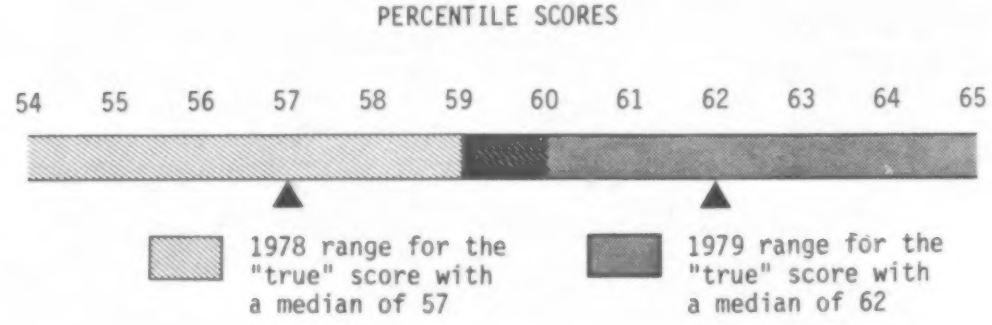
Interpreting Percentile Scores

It is important to recognize that any score derived through sampling is an estimate of the "true" score. In practical terms, this means that if all students at a grade level were tested on the CTBS, it is likely that the percentile scores would be slightly different from those gathered through sampling.

In general, the reported percentile scores on the CTBS can be shown to fall within two or three points of the "true" median.

As an example, the median scores of eighth graders on the reading test are at the 57th percentile in 1978 and the 62nd percentile in 1979. Based on a range of three points either side of these scores, the "true" percentile score for 1978 falls between the 54th and 60th percentiles. For 1979, the range is between the 59th and 65th percentiles.

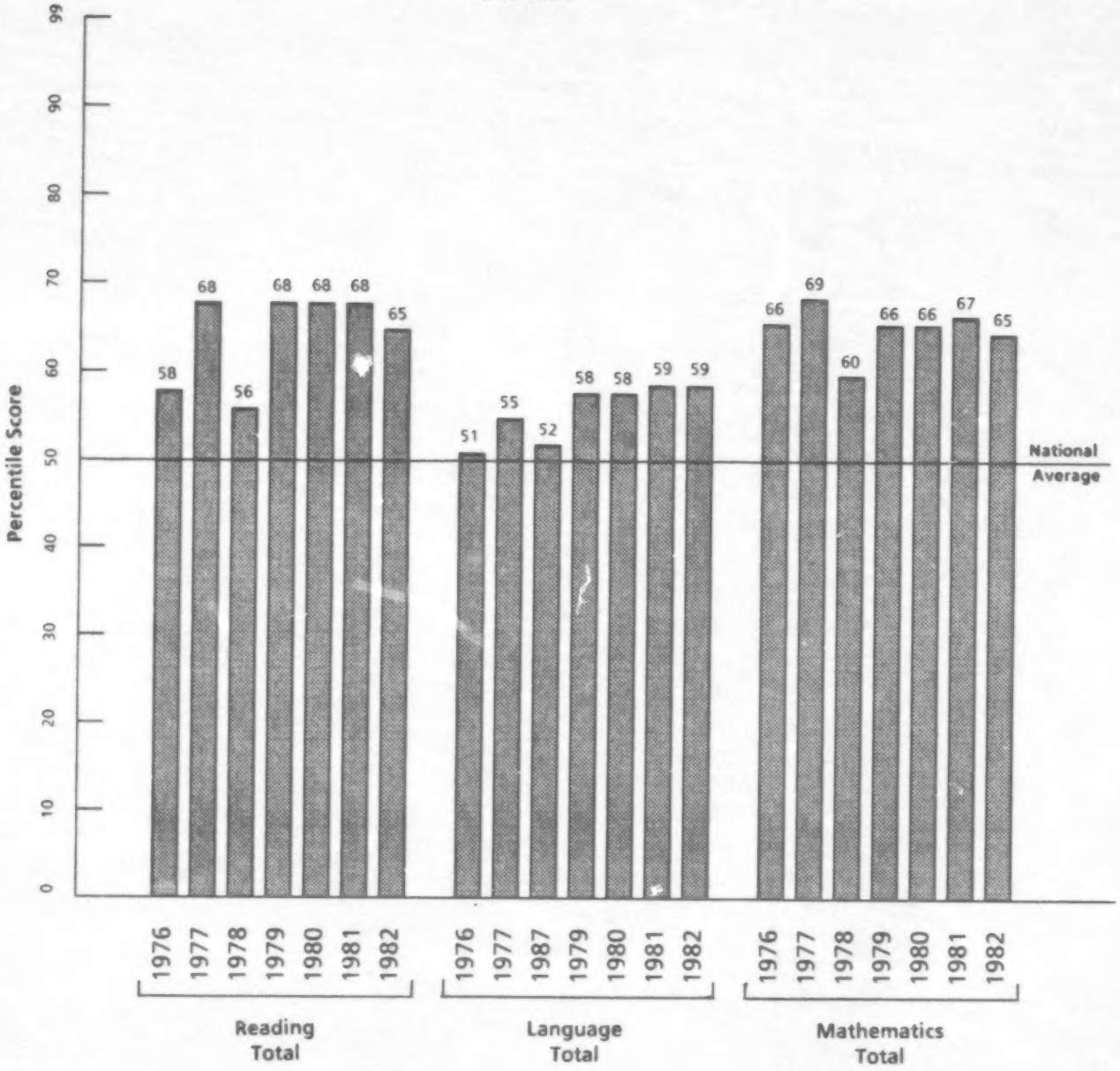
In effect, it is possible that the "true" percentile scores in the above example for 1978 and 1979 are identical. That is, the true percentile score may fall in the overlapping area as indicated below.


PERCENTILE SCORES
54 55 56 57 58 59 60 61 62 63 64 65
1978 range for the "true" score with a median of 57
1979 range for the "true" score with a median of 62

When comparing scores derived though sampling, it is important to calculate the possible range for the score. In general, at least five percentile points between CTBS scores is necessary before concluding that there is a difference in the "true" scores and not a random fluctuation.

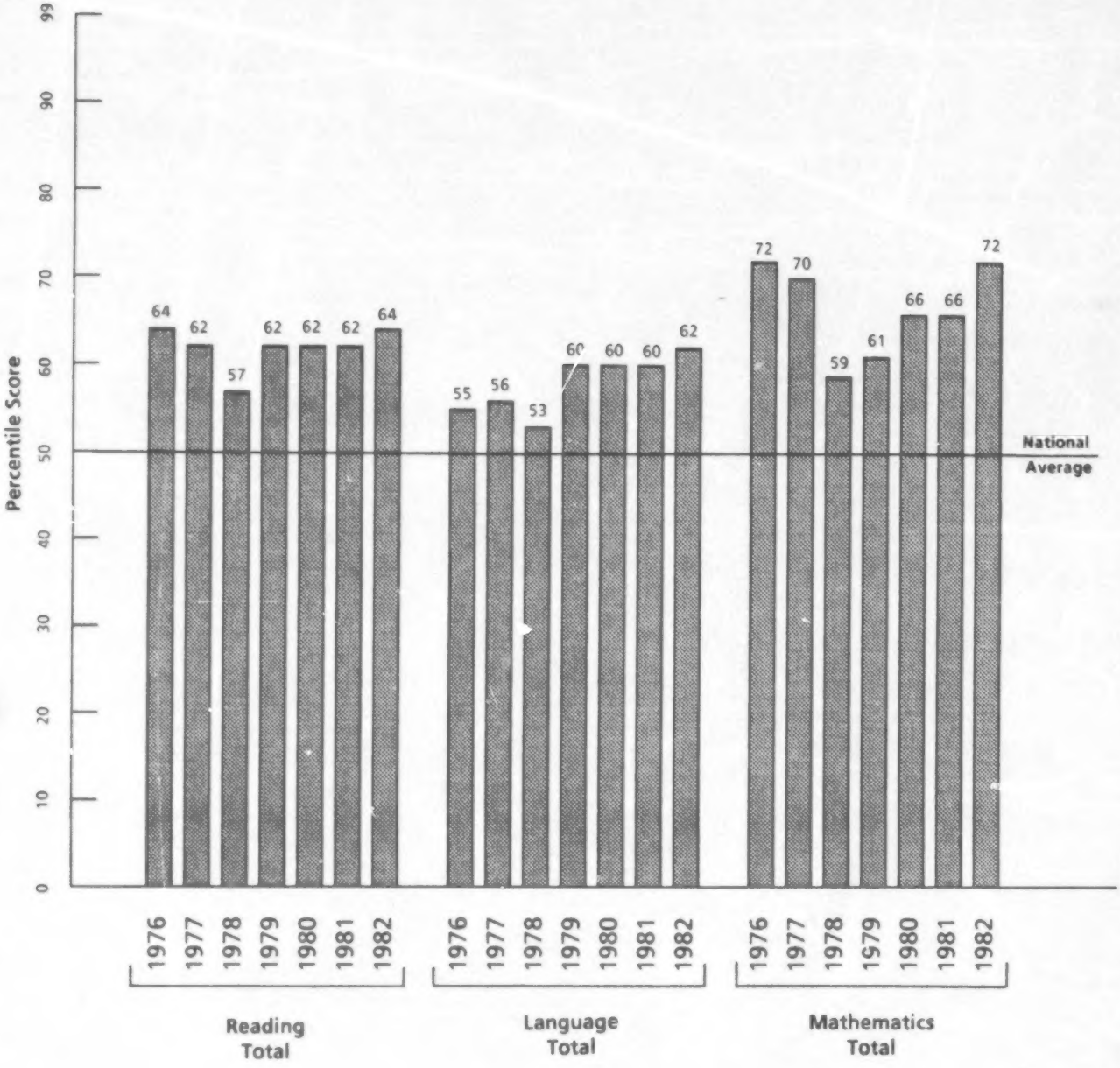
*Published by CTB/McGraw-Hill

Comparison of the Wisconsin Fourth Grade Scores to the National Average on the Comprehensive Tests of Basic Skills 1976-1982



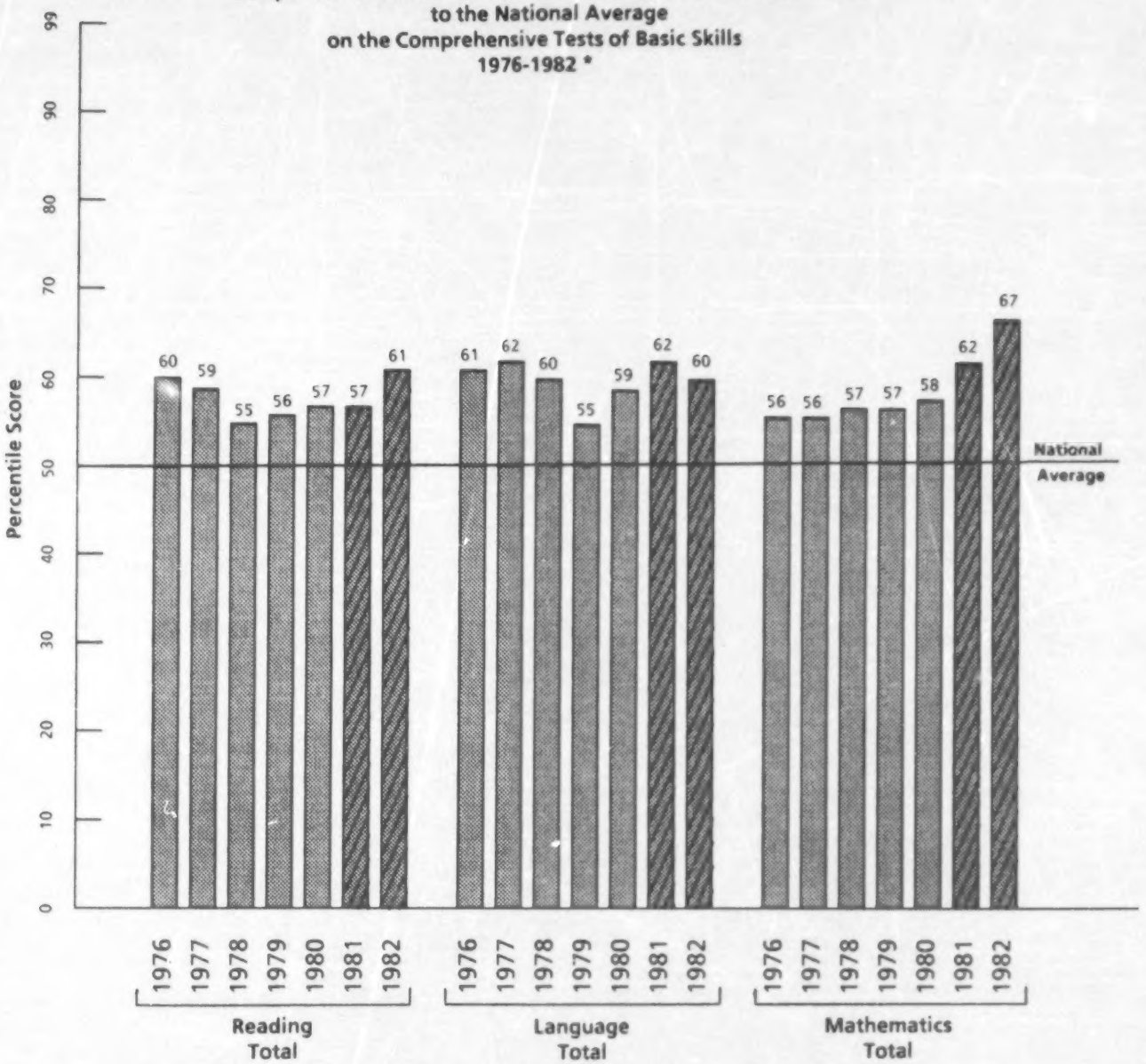
Scores of fourth graders over the seven-year period average approximately 12 percentile points above the national average.

Comparison of the Wisconsin Eighth Grade Scores to the National Average on the Comprehensive Tests of Basic Skills 1976-1982



Eighth grade students average 12 percentile points above the national average during the period, 1976-1982.

Comparison of the Wisconsin Eleventh and Twelfth Grade Scores to the National Average on the Comprehensive Tests of Basic Skills 1976-1982 *



* From 1976-1980, twelfth graders were tested. Beginning in 1981, eleventh graders were given the CTBS. The 1981-1982 results shown are for the eleventh grade sample.

Twelfth graders average approximately 8 percentile points above the national average from 1976 to 1980. Eleventh graders average about 12 percentile points above the national average in 1981-1982.